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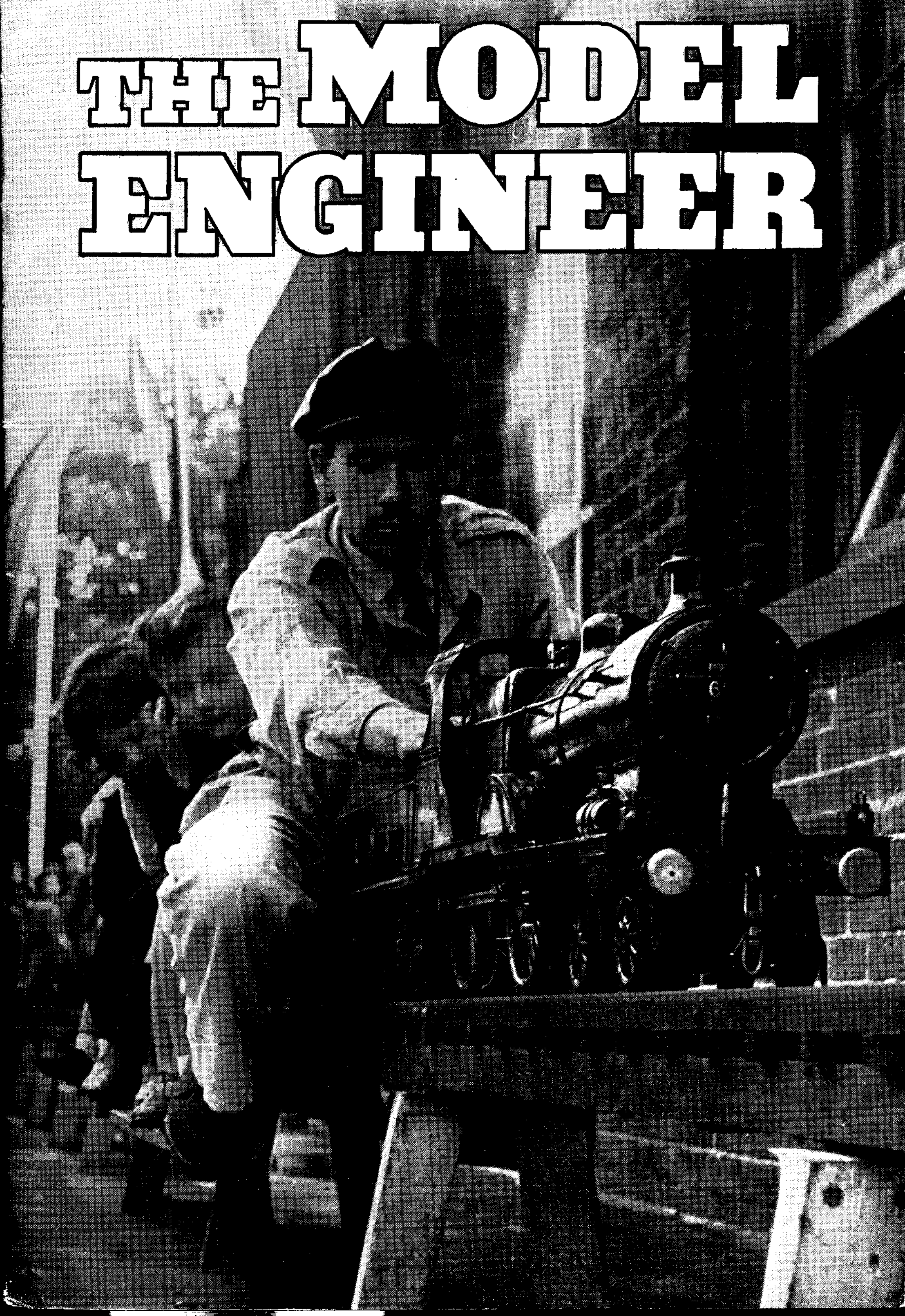
THE MODEL ENGINEER



The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

2ND OCTOBER 1952 VOL. 107 NO. 2680

SMOKE RINGS

Our Cover Picture

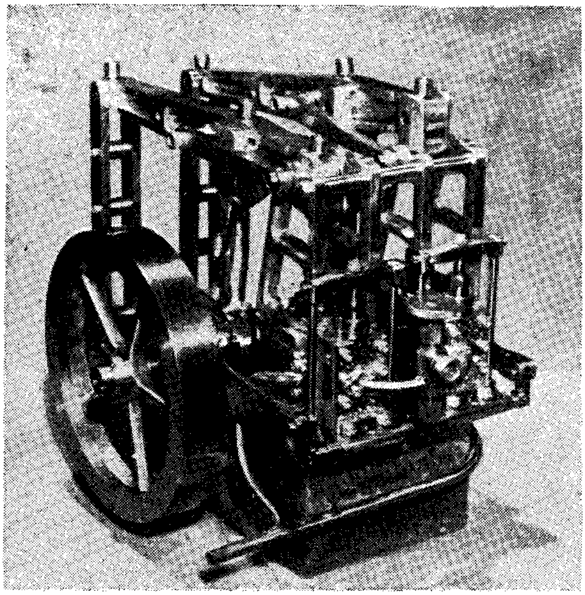
● THE SUBJECT of this week's cover picture is a 5-in. gauge 4-4-0 locomotive which was "caught" by our photographer's camera at the Crosby Model Club's exhibition recently. Unfortunately, we have no particulars of the engine or who built it; but it appears to be a fine piece of work, thoroughly representative of the well-known L.M.S. Class 2 passenger engines which have done so much good work on secondary duties in the Midland Region, and, formerly, on the L.M.S. and Midland Railways.

A Distinguished Australian Visitor

● WE HAVE had the pleasure of a visit from Mr. L. R. East, president of the Institution of Engineers, Australia, and vice-president of the Melbourne Society of Model and Experimental Engineers. He had previously advised us that he would be paying a very hurried visit to London about the middle of September and desired to take the opportunity of meeting us, to convey personally the good wishes of the Melbourne Society to "the men behind THE MODEL ENGINEER"; he very kindly invited us to lunch, and the little party was further honoured by the presence of the Earl of Northesk, president of the Society of Model and Experimental Engineers.

Naturally, the chief topic of conversation was model engineering; we were very interested to learn that Mr. East first became acquainted with THE MODEL ENGINEER in 1902 when his father took home some copies from Great Britain after representing Australia in a Bisley rifle team. Since that time, Mr. East has followed practically everything that has been written in the journal, and his collection contains practically all of the early issues as well as everything printed since about 1930. He was kind enough to tell us that he had long wanted to meet the men who, as he put it, "have given so much to so many thousands of model engineers all over the world, and who, as a consequence, have become real personalities to great numbers of men whom they have never met."

For our part, we were more than glad to have this opportunity of reciprocating our good wishes personally, through Mr. East, to many unknown friends on the other side of the world. Instinctively, we thought of our founder and late chief, Mr. Percival Marshall, and how much he would have valued and appreciated this happy little gathering. The spirit and ideas which urged him to found THE MODEL ENGINEER are with us all and are ever in our minds; we do our best to live up to them, in spite of changing times, and our first desire is to produce a friendly journal that will help model engineers, in all their interests, to forget worldly worries.



Apart from the great pleasure of meeting Mr. East personally, we regard him as a symbol of the success of THE MODEL ENGINEER, and for that we are more than grateful.

And we must not forget to mention a most pleasing and acceptable gift which Mr. East brought with him from some of his fellow-members of the Melbourne S.M.E.E. It is a home-made album containing signatures of members of "The Gang," i.e. The Surrey Hills Live Steamers, and photographs of many of their locomotives. The album is the work of Mr. R. J. Shirley, who helped to found "The Gang." This is a very nice little tribute which is much appreciated by its recipients.

Another U.S.A. Enthusiast

● WE HAVE received a letter from Mr. A. G. Seels, of Seattle, enclosing some photographs of his models, including one of the very handsome double grasshopper beam engine, built from data obtained from THE MODEL ENGINEER. Mr. Seels is a craftsman of the old school, now retired from business, and devoting most of his time to model engineering. He expresses admiration for the old-time engineers and wonders how they managed to produce such excellent work with very primitive tools and equipment. Of his own models, he mentions a "P. V. Baker" locomotive, a traction engine and several small steam engines, and he has started on the construction of a stern wheel paddle boat. He would be glad to hear from British readers, to compare notes and views, and we shall be pleased to forward any correspondence addressed to him c/o this office. On the occasion of his visit to Europe about three years ago, Mr. Seels called at this office, and we had a long conversation with him on models, tools and workshop equipment. We found him a most interesting and colourful personality, typical of the pioneer spirit which, during its short history, has made the United States great in all the useful arts which contribute to human progress. He tells us that he looks forward eagerly each week to the arrival of THE MODEL ENGINEER, and thanks us for the wealth of good reading it invariably contains. His model beam engine is shown above.

The Paris International Regatta

● FROM THE brief particulars of this event which have reached us up to date, we learn that British competitors achieved distinction in both "A" and "C" classes for racing hydroplanes. In the former class, the only boat to finish was Mr. K. Williams' veteran *Faro*, with a speed of 44.49 m.p.h. M. Suzor had the misfortune to break the tethering bridle and crash *Nickie 9* in this event. The "C" class event was very closely contested and produced the highest speeds of any European contest which has so far been brought to our notice. The placing in this event was as follows: W. Everitt (Victoria), *Nan*, 76.058 m.p.h.; M. Penard, *Grillon*, 75.42 m.p.h.; M. Leuba, *Folbrise V*, 71.616 m.p.h.; G. Stone (Kingsmere), *Lady Cynthia*, 66.54 m.p.h.; M. Leuba, *Be-bop*, 65.75 m.p.h.; and R. Phillips (S. London), *Foz 2*, 62.79 m.p.h.

The "Dangerous" Amateur

● AT A recent inquest on a man who was electrocuted in fixing a television aerial, the coroner remarked "Unfortunately this sort of thing happens to a lot of amateur electricians." We are inclined to question this statement; it would be of interest to know the comparative figures of accidents incurred by amateur and professional electricians respectively, or caused as a result of defects in their work. But the importance of a sound knowledge of both the principles and practice of electrical work, in either case, cannot be over-emphasised. There are, as everyone knows, good and bad, careful and slipshod, skilled and ignorant, workmen in both classes. Comparisons are always odious, and from our experience with amateurs in all fields of mechanical and electrical engineering we consider that it is unfair to single them out for censure when things go wrong. Many amateurs that we know are highly competent, and more conscientious than the average professional mechanic. In the articles published in THE MODEL ENGINEER, we have always been careful to instruct readers on sound methods, and to urge that proper precautions should be taken to avoid the risk of accidents. The very small premiums charged by insurance companies for covering risks incurred in various phases of model engineering activities is a proof that our readers take these precepts to heart. "A little learning is a dangerous thing"—but if the learner recognises his limitations and follows the path of discretion, danger can be reduced to the vanishing point.

SLOTTING IN THE LATHE

by "Duplex"

THE shaping attachments for the lathe, described in previous articles, serve well for machining single parts held in the mandrel chuck or on the faceplate ; but when dealing with a batch of components, the manual work entailed is apt to become tiresome and, in addition, the shape of the parts may not afford the chuck jaws a secure hold.

To overcome both these difficulties, a slotting attachment was made for the lathe some years ago, and this has since proved its value when, for example, machining a set of locomotive axle parts.

The photograph, Fig. 1, was taken by Mr. E. T. Westbury in our workshop and shows the original attachment slotting a locomotive hornblock. As will be seen, the arrangement was largely improvised from parts that happened to be available at the time.

The lathe top-slide is used for the slotting slide and is actuated by means of a short connecting-rod, driven from a crankpin attached to a spare chuck backplate. The slide base is bolted to an improvised, built-up bracket clamped to the lathe bed.

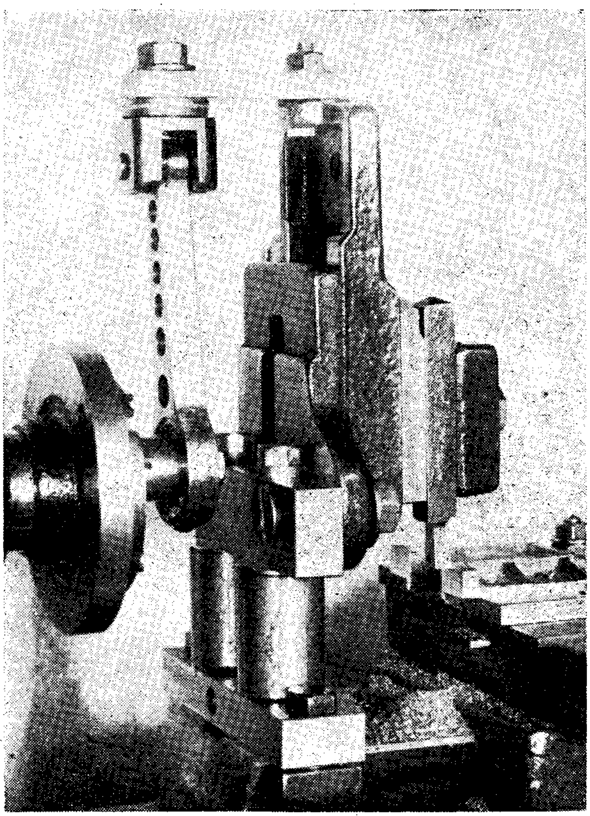


Fig. 1. The improvised slotting attachment

The crankpin consists of a cast-iron distance-piece, secured by a bolt to the slotted chuck backplate ; this arrangement enables the crank throw to be varied from zero to 1 in. to suit the particular piece of work. As the full range of mandrel speeds is available, the faster speeds can be used with advantage when the stroke is shortened. To enable the base of the top-slide, when in operation, to clear the work, the tool seen in the photograph had to be mounted in the toolpost on a packing block, but to avoid unnecessary overhang, the tool should always be kept as close as possible to the top-slide clamping face.

When Mr. Westbury saw the improvised slotting attachment, he decided to prepare a set of drawings for building the slotter from castings, and the outcome, embodying the original features, is reproduced in Fig. 2. The cast bed-bracket for mounting the slide is, however, much more rigid than the improvised, built-up bracket. In addition, Mr. Westbury added a T-slotted bracket for carrying the small-end bolt of the connecting-rod ; this arrangement enables the position of the tool to be adjusted in relation to the work, and saves having to set the tool itself, as in the original design.

A small number of these slotting attachments, based on Mr. Westbury's design, was later made by the Myford Engineering Co., and one of these is shown in Fig. 3 mounted on a 3⅛ in. lathe.

As will be seen in Fig. 2, Mr. Westbury's design incorporates a strip, part 9, for aligning the slide vertically, but in the Myford attachment the register strip is placed horizontally, as shown in Fig. 3, in order to clear the second clamp-bolt, fitted to the top-slide for greater security when taking a heavy cut.

However, there is no difficulty in aligning the slide vertically, if the test indicator is used to check the slide movement in the way later described. In the original layout the top-slide was clamped to its bracket by a single bolt, and this held securely when taking the light cuts necessitated by the rather unsteady bracket mounting. As a slotting attachment for the lathe had been found so useful, it was decided to build a fitting on similar lines for the M.L.7 lathe installed in the workshop.

Again, the lathe top-slide serves as the slotting slide, and, for want of castings, the remaining

parts have mostly been fabricated from mild-steel stock. There is no difficulty in securing the bed bracket to the lathe, as the undercut bed shears enable a single bolt and clamp plate to be used in the same way as is employed for mounting the fixed steady.

When designing the attachment, an attempt was made to reduce as far as possible the overhang of both the crankpin and the slotted bracket operating the slide; but this has the effect of limiting the width of the bed bracket footing. However, a compromise was reached, and the footing is wide enough to give stability without requiring excessive overhang in the working parts.

Under working conditions, the rigidity of the mounting and operating gear has been found quite satisfactory for doing light machining, and cuts of 4 thousandths of an inch are easily taken in mild-steel with the lathe self-act in operation.

Setting the Slide

When setting the slide travel to keep the tool just clear of the surface of the boring table, a strip of material, $\frac{1}{16}$ in. in thickness, is first placed on the table to support the point of the tool when the small-end clamp-bolt is loosened and the slide is pushed downwards. After the lathe mandrel has been turned to set the crankpin at its lowest point, the small-end bolt is tightened and the setting strip is removed.

The method used for setting the slide exactly square with the table is illustrated in Fig. 8. The test indicator, mounted in the toolpost, is brought into contact with the edge of a try-square lightly clamped in place on the boring table.

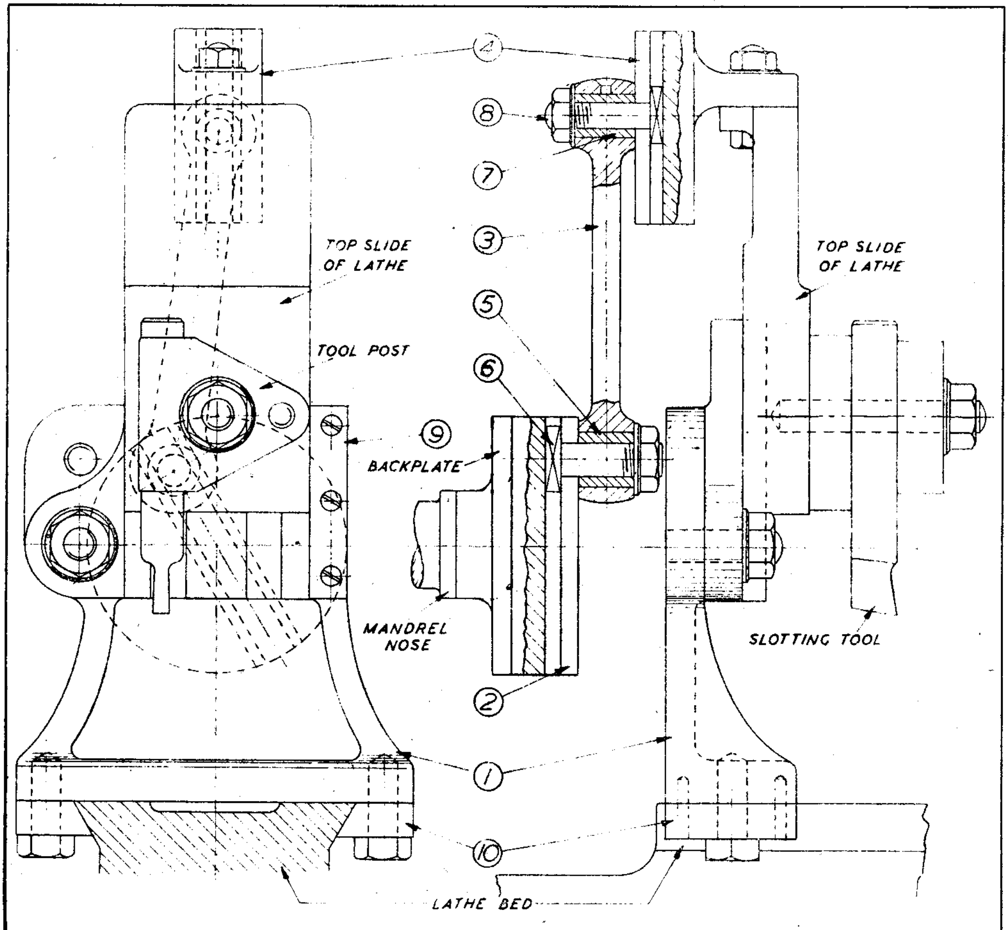


Fig. 2. The slotting attachment designed by Mr. Westbury

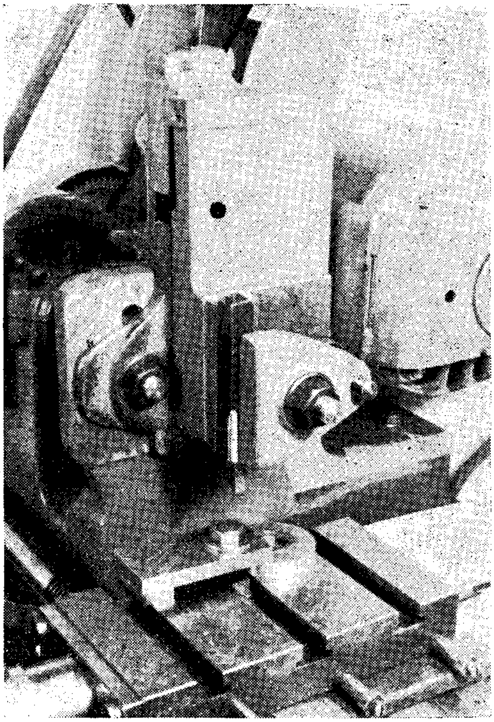


Fig. 3. A slotting attachment, made by the Myford Engineering Co., fitted to a 3$\frac{1}{2}$-in. lathe

The position of the slide is then adjusted until identical readings are obtained at each end of the stroke. For future reference, an index line should be scribed on the bed bracket opposite to the zero-line engraved on the slide base and, provided that the slide pivot stud is accurately fitted, these marks should enable the slide to be reset correctly. With the aid of a protractor, resting on the boring table and with its blade in contact with one of the slideways, the slide can also be set vertical or to machine to any required angle.

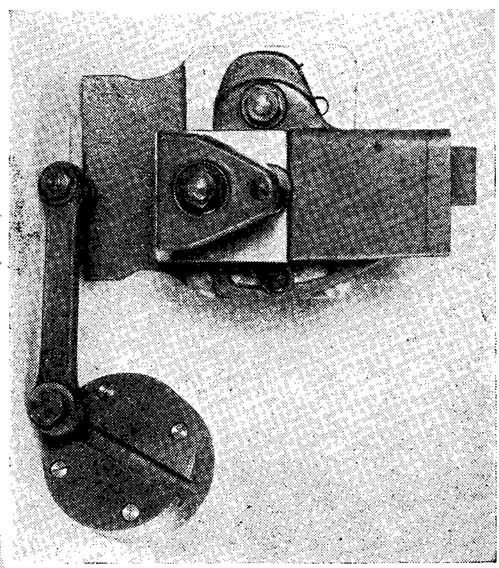
Mounting the Work

As shown in Fig. 5, the whole surface of the boring table is available for clamping the work in position, and the tool is normally set vertically, as illustrated in Fig. 9A, where a keyway is being cut in a pulley. If, however, as shown in Fig. 9B the work is held in a machine vice secured to the boring table, the increased height of the mounting may necessitate raising the tool by setting it horizontally.

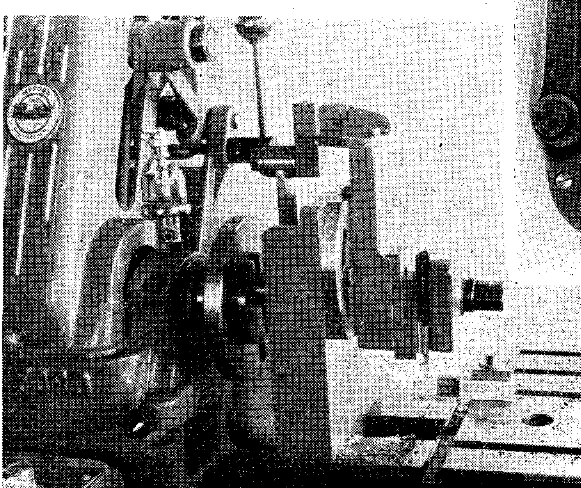
Where the tool has to enter deeply into the work, as in the operation of machining the horn-block depicted in Fig. 1, a packing-piece will have to be placed under the tool to carry it forward; otherwise, either the work-piece or the lathe saddle may come into contact with the bed bracket before the tool has reached the end of the cut.

It is not suggested that the attachment should be used for heavy machining, but rather that it should serve for doing some of those awkward jobs usually dealt with in the milling machine or shaper.

Taking a heavy cut would, of course, throw considerable strain on the lathe mandrel and its bearings, and it is advisable to use a fine feed,



Above—Fig. 4. Components of the Myford attachment



Left—Fig. 5. A fabricated slotting attachment for the Myford M.L.7 lathe

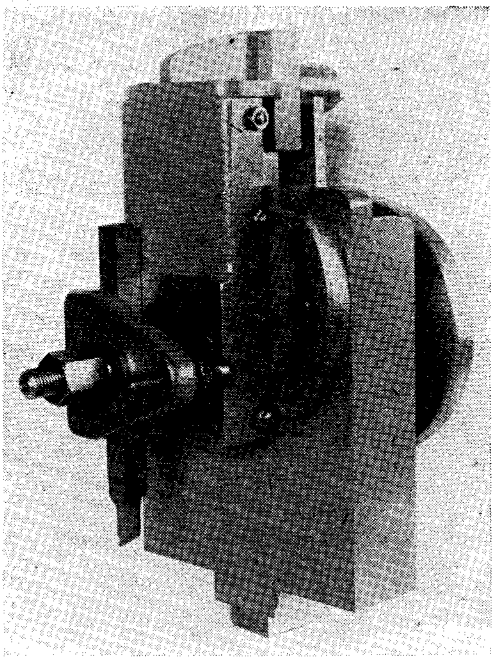


Fig. 6. Front view of the built-up attachment

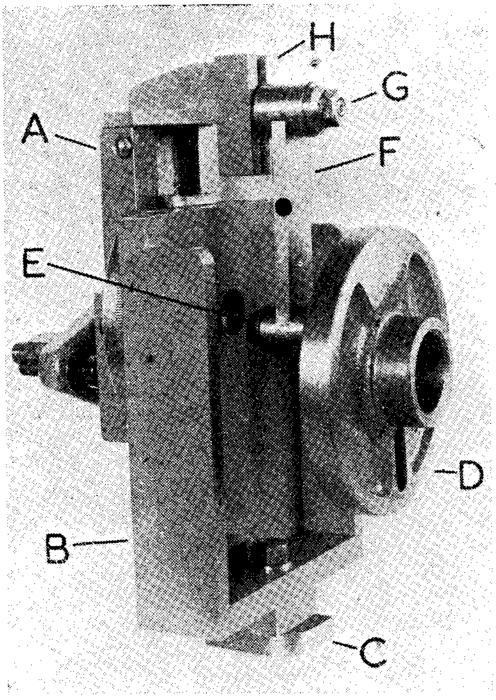


Fig. 7. Showing the driving mechanism of the attachment. "A"—the topslide; "B"—the bed bracket; "C"—the clamp plate; "D"—the crank disc; "E"—the crankpin; "F"—the connecting-rod; "G"—the small-end bolt; "H"—the slide bracket

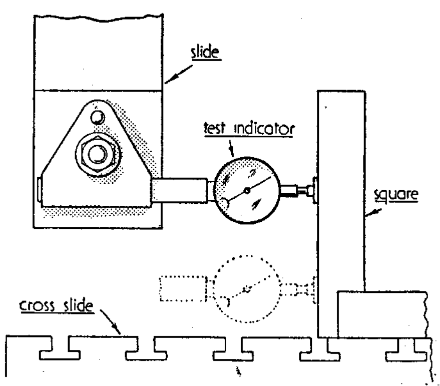


Fig. 8. Showing the method of setting the slide vertically

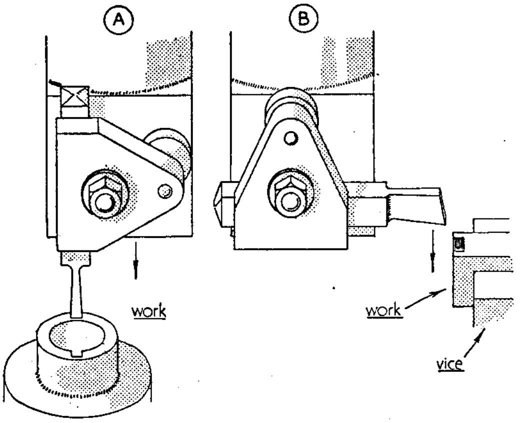


Fig. 9. "A"—cutting a keyway in a pulley; "B"—the slotting tool set horizontally

either by hand or from the self-act, with the lathe running at a moderate speed. As the stroke is shortened, so its rate can be increased, and satisfactory work has been done with the lathe driven at its highest speed.

Should the tool jam in the work, as a result of too rapid feeding, there should be no danger of doing any damage if the driving belt is adjusted so that it will slip in the event of a serious overload.

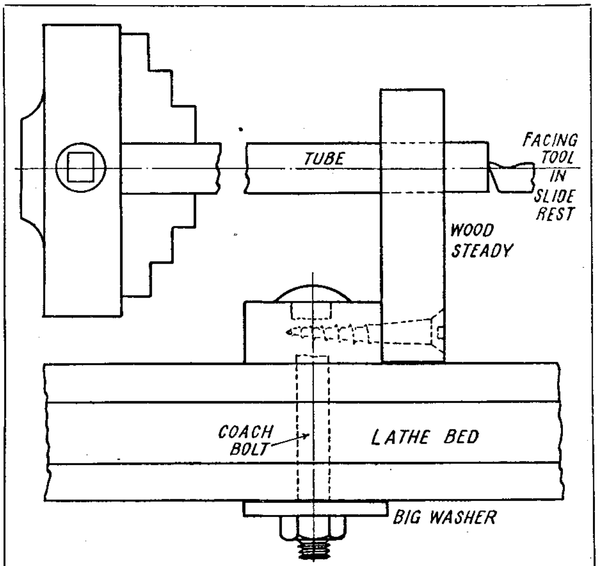
"Britannia" in $3\frac{1}{2}$-in. Gauge

by "L.B.S.C."

Smokebox Tubeplate and Tubes

AS we shall need the smokebox tubeplate to use as a spacer and support for the tubes whilst silver-soldering them into the end of the combustion chamber, this item can be made next. The same method is used, but the copper needed is a little thicker, viz. $\frac{1}{8}$ in. or 10-gauge. A circular forming plate will be required, a bare $4\frac{1}{8}$ in. diameter, which will form the smokebox tubeplate large enough to allow for turning the outside of the flange to correct diameter, so that the smokebox shell will fit over it. In the days gone by, when I used to wheel my gasoline buggy up to town every week and deliver my copy personally to the "M.E." offices, I invariably did a bit of shopping; and if I saw anything going cheap, that I thought might come in handy, like a feminine bargain-hunter at the sales, I bought it. Consequently, the present era of artificial scarcity and outrageous prices, has affected me very little indeed. Among the things I purchased, were various sizes of chuck-back castings, so that if I acquired a new chuck, or wished to refit an old one to another lathe, I wouldn't have any delay. These castings, turned temporarily on edge and face, have made nobby formers for smokebox tubeplates, without spoiling them for their original purpose, as they would have to be turned, anyway—vot you tink, eh? Hoots, mon, awa' wi' ye! The thickness of the castings allowed for forming the widest flange I was ever likely to need on a smokebox tubeplate.

As the smokebox tubeplate for *Britannia* is $\frac{5}{8}$ in. deep over flange, cut out a circle of $\frac{1}{8}$ in. sheet copper approximately $5\frac{5}{8}$ in. diameter; anneal it, and flange it over the former, in the same way that the combustion-chamber tubeplate was formed. It will probably need annealing two or three times during the process, owing to the wide flange; don't run any risk of cracking it, but anneal as soon as it "goes hard" under the hammer. When the flange is nicely formed, chuck the tubeplate in the three-jaw, flange outwards, and skim off the ragged edge. Then reverse it, and hold by the inside of the flange, on the outside of the top steps of the outside jaws. Turn to $4\frac{5}{16}$ in. approximate diameter, a nice fit in the end of the boiler barrel. Next, scribe a line across the side opposite to the flange, cutting right across the middle of the embryo tubeplate; and at $\frac{9}{16}$ in. from the edge of it, scribe another short line at right-angles to the first one. Put the former used for the combustion chamber, on the smokebox tubeplate in such a position that you can see the short horizontal line through the two bottom holes, and the long line crossing the centre of the hole immediately above. Clamp the former to the tubeplate in that position, and put a drill through all the holes in the former, carrying on through the copper, same as when drilling the combustion-chamber tubeplate. Remove former, then open out and ream to $\frac{7}{16}$ in. and $\frac{3}{4}$ in. as before; but this time, put the reamer well in, to its full diameter, and slightly countersink the holes on *both* sides. The countersinks on the side opposite flange guide the tubes into the holes, and the others take a fillet of silver-solder, making a very sound job.



Improvised tube steady

The tapped holes for stays and steam pipe fittings are set out as shown in the drawing reproduced in the last instalment. The hole for the steam pipe flange, $\frac{5}{8}$ in. from top, on the vertical centre-line, is drilled 29/64 in. and tapped $\frac{1}{2}$ in. × 32. The hole 1 in. to the left, and level with it, is drilled 7/32 in. and tapped $\frac{1}{4}$ in. × 40

for the blower union fitting. At $\frac{13}{16}$ in. below, drill four 9/32 in. holes at the spacing shown, and tap $\frac{5}{16}$ in. × 40. A drop of cutting oil, as used for turning steel, is a wonderful help in drilling and tapping soft copper.

Four pieces of $\frac{3}{4}$ in. × 20 gauge seamless copper tube, and thirteen pieces of $\frac{7}{16}$ in. × 22 gauge, should be sawn to full length, so that the ends can be squared off to correct length of $10\frac{9}{16}$ in. If your lathe has a hollow mandrel bored large enough, the tube can be faced off at the ends, with only $\frac{1}{2}$ in. or so projecting from the chuck jaws; but if the mandrel is small-holed or solid, the following wheeze may be found useful. Nail or screw two bits of wood about $\frac{1}{2}$ in. thick—anything you may have handy—at right-angles. Put a $\frac{7}{16}$ in. drill in the three-jaw, and push the wooden angle on to it, so that the drill cuts a hole through the vertical member. Then put a tube in the chuck, as far as it will go; push the wooden angle over the free end for $\frac{1}{2}$ in or so, and bolt it to the lathe bed with a coach bolt and a big washer You can then face off the projecting end of the tube in two wags of a dog's tail, and apply a piece of emery-cloth to it after facing. The scratchy surface left, forms a nobby key for the silver-solder. When all the $\frac{7}{16}$ in. tubes have been done, enlarge the hole to $\frac{3}{4}$ in. and ditto repeato operations on the flues. If your lathe has the boring-table type of saddle, like the Drummond lathe of fond memory (and price!) the improvised steady can be bolted to that, instead of the lathe bed. By the way, don't forget to use a fine-toothed saw for cutting thin tubes; and the widest blade makes the straightest cut. Personally, I use a small edition of a plumber's pipe-cutter.

How to Fix the Tubes

While the *modus operandi* for fitting and silver-soldering the tubes follows that described for *Tich*, it is a bit more complicated, as there are a lot more tubes than in the wee boiler; so inexperienced workers will have to watch their steps. To make absolutely certain that every tube has a fillet of silver-solder all around it, it would be advisable, even for experienced workers, to do the job in two stages, as follows. First of all, fit the ends of the four $\frac{3}{4}$-in. flues into the holes in the combustion-chamber tube-plate, letting them project about 1/32 in. inside the chamber; then fit the upper row of $\frac{7}{16}$ in. tubes, in similar manner. Put the smokebox tubeplate on the outer ends, to act as a spacer and support, and adjust the tubes so that they are parallel with the sides and top of the combustion chamber. Stand the whole issue in the brazing pan, with the tubes pointing skywards, and give the joints between tubes and tubeplate a good dose of wet flux. For first-grade silver-solder, borax powder mixed to a paste with water, will do; or Boron compo can be used, as it is equally effective for silver-soldering, as for ordinary brazing. If it is proposed to use Easyflo, which I recommend (not because I have any shares in Johnson-Matthey's—I wish I had—but because I use it myself) use the special flux supplied for use with it. Make sure that a good fillet of the wet flux completely encircles each tube, because the silver-solder will emulate Mary's little lamb, and is sure to go wherever the flux goes.

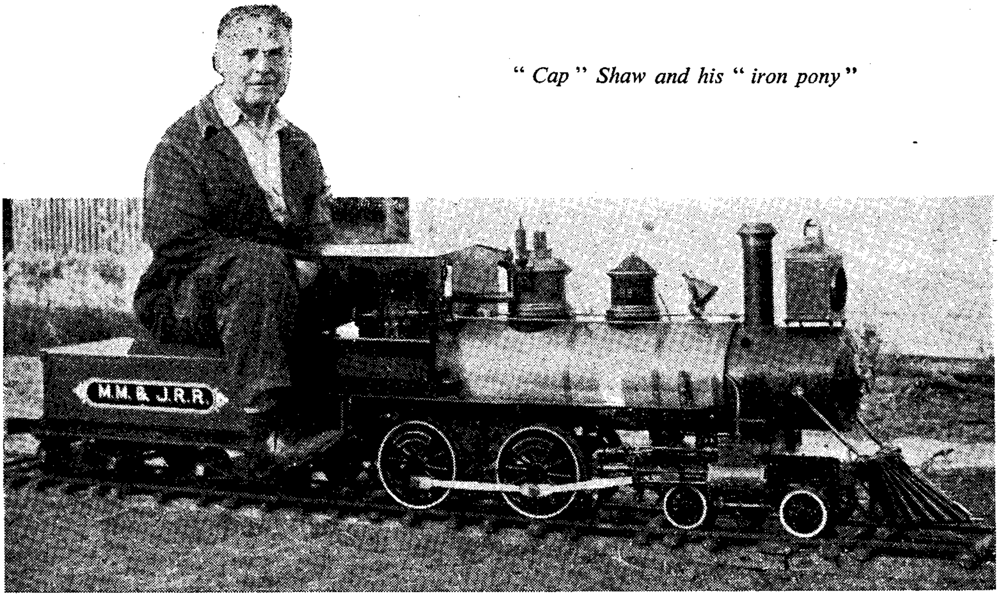
Warming Up

Pile up the coke or breeze all around the assembly, almost to the tubeplate, and first heat up the end of the chamber and the tubeplate, keeping the flame off the tubes as much as possible. When this glows red, along with the surrounding coke, play on the four larger tubes, keeping the flame as low as possible, to maintain the tube-plate at a dull red. When the whole lot, tube-plate and tubes, are at the same degree of redness, and the flux has all fused, apply a strip of silver-solder, or Easyflo, as the case may be, to each tube. If the fluxing has been properly done, and the heat is sufficient, the end of the strip will melt as soon as it touches the red-hot copper, and "flash" around the tube end filling the countersink, and forming a perfectly even fillet. Yes, it is *just as easy as that*; yet some folk make an awful botch of the job, and get leakage at the tube ends in the combustion chamber, after the boiler has been completely assembled. The great thing is, to have the *right* heat; like the famous shaving-soap advertisement, not too much and not too little. Too much, will "boil" the silver-solder, and the joint will be porous, owing to bubbles forming in it as the silver-solder solidifies. Too little results in an imperfect amalgamation (says Frisby Dyke) between silver-solder and copper, and the expansion and contraction of the boiler will crack the joint and cause leakage. The best advice I can give inexperienced workers, is to make a trial run by drilling a hole in a bit of scrap copper, sticking the stub end of a scrap piece of tube in it, and seeing for themselves just how hot they have to make it, before a piece of silver-solder, applied to the joint, performs the flashing-around act. The knowledge and experience gained, is well worth the tiny bit of silver-solder that is used in the experiment.

Be Careful

When the four $\frac{3}{4}$-in. flues have been successfully fixed, go around to the other side, and ditto repeato operations on the six $\frac{7}{16}$-in. tubes in the next row; but this time, be what the kiddies call "a bit more carefuller," because the tubes are smaller and thinner, and there is more risk of overheating them and burning the copper. Keep the flame on the thick tubeplate as much as possible, only letting it lick the tubes just enough to bring them to the same heat. A big diffused flame is far and away the best for silver-soldering tubes; the intense concentration of an oxy-acetylene flame is just what you *don't* want for this job. It would not only be liable to burn the tubes and "boil" the silver-solder, but you might also suddenly find that you had one big ragged hole instead of a lot of little round ones!

After silver-soldering the second row, and taking a good quiz all around each to make quite certain that no places have been missed, let the job cool to black and carefully lower it into the pickle bath. After about 15 to 20



"Cap" Shaw and his "iron pony"

minutes, fish it out again, wash off well in running water, and then, with some coarse steel wool, or a wire brush, clean up the rest of the tube holes. The remainder of the tubes can then be inserted, fluxed, and the above silver-soldering process repeated, being careful to keep the flame off the tubes until the tubeplate begins to glow red. Pay particular attention to the middle merchant in the second row. This one tries to hide behind the two in the bottom row; but you can get at it between them, also at the sides, between its companions at either side, and the two bottom tubes. You can also see if the silver-solder has gone right around by looking between the two inner ¾-in. flues and the centre gap in the row of smaller tubes immediately below. Take no chances; make certain everything is O.K. before you "sign off" that part of the business. Before pickling for the second time, pull off the smokebox tubeplate and heat the free ends of the tubes to a dull red. This will not only soften them for expanding into the smokebox tubeplate before silver-soldering, but the pickle will clean them ready for the job.

First Stage of Assembly

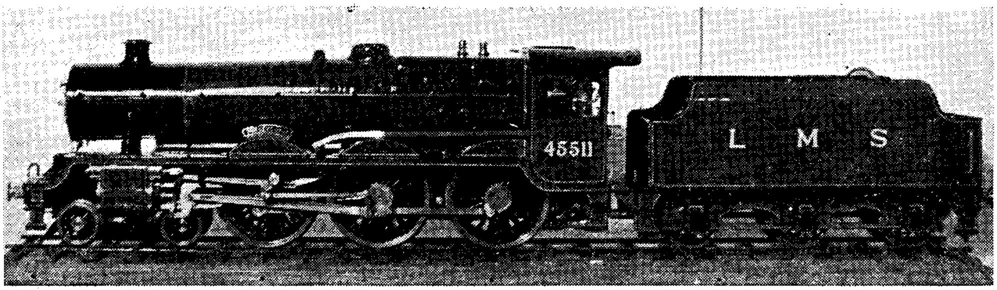
The next job is to fit the firebox and tube assembly into the boiler shell. First of all, cut a piece of ¼ in. soft square copper rod, long enough to fit tightly between the flanges at the bottom of the throatplate; see dotted lines at the bottom of the illustration of the cross-section through firebox. This should be well cleaned and slightly bevelled along two sides, as shown by the black markings. Clean along the bottom of the throatplate and jam the piece of rod in position. The tops of the firebox crownstay flanges and the inside of the Belpaire wrapper should also be cleaned. Then insert the firebox and tube assembly into the shell. Butt up the front plate of the firebox tightly against the piece of square rod, which will form the front section of the foundation ring, and put a couple of toolmaker's cramps, one near each end, over the lot, to hold the firebox temporarily in position. The crownstay flanges should be touching the top of the wrapper sheet, as seen in the cross section, and a couple of cramps should be put over these also, to hold them in place whilst drilling the first rivet holes. See that the firebox is located midway between the sides of the wrapper, so that the water spaces will be the same width both sides.

Away with the Cramps

Next, drill a couple of No. 41 holes through wrapper and crownstay flanges, near the back end, and put temporary bolts in; just ordinary 3/32-in. or 7-B.A. screws put through from inside and nutted outside. The cramps can then be taken away. Drill No. 41 holes through throatplate, square rod and firebox front plate near the ends, and put in a couple of long 3/32-in. copper rivets; the cramps can then be dispensed with.

The crownstay girder flanges can now be riveted to the wrapper. Drill No. 41 holes through the lot, at about ¼ in. from the front ends of the girders; countersink them on the outside and put 3/32-in. copper rivets in. For a riveting dolly, use a piece of bar about 1 in. × ½ in. section, and long enough to project 6 in. from the side of the vice jaws, plus the width of the jaws. Take out the hardened jaw insets and rest the bar on the ledges left; if the vice is well tightened up the bar won't slip. The rivets can be inserted by aid of a strip of metal with a notch at the end like a distant signal, to hold the rivets. Poke the rivet through, pull away the

"holder," slide the boiler over the bar in the vice until the head of the rivet rests on it, and hammer the end of the rivet into the countersink. Inexperienced workers please note—hit the *rivet*, not the wrapper sheet, or the boiler will look as though it had been to Korea. Take out the temporary bolts at the back end and replace by rivets; the rest of the holes along all four flanges can then be drilled at about ½ in. centres and all the rivets put in. The riveting at the bottom of the throatplate can then be finished, putting the rivets in at about ½-in. centres. There is no need to bother about fancy heads, even if you are as good at it as the builder of *Pimples*; nobody sees them, the brazing looks after the strength of the joint, and we are going to put a cleading sheet over the lot, anyway, to hide up the stayheads. Did I hear somebody say: "Isn't she getting heavy?"



A fine "Doris" type engine by Mr. D. G. Webster

How to Fit Smokebox Tubeplate

Clean the inside of the front end of the boiler barrel and carefully insert the smokebox tubeplate, flat side first, taking care that it is exactly vertical Tap it down gently until it touches the tubes. Line up all the tubes with the holes by aid of a wooden skewer, wood knitting needle or a blacklead pencil; then continue the tapping-down process until the tubes come through about 1/32 in. or so, and the flange of the tubeplate stands out not less than ¼ in. from the end of the barrel. Don't tap the extreme end of the barrel into close contact with the tubeplate flange; there should be a V-groove between them, which is filled up with brazing material.

The tubes should now be expanded into the holes, and this is easily done by aid of a tapered piece of steel, like the shank of a drill, known among boilersmiths as a "drift." I actually use drill shanks for this job, having had some broken taper-shank drills given to me a long while ago. Just grease the taper, insert into tube, and give a few light taps with a hammer, just enough to swell out the tube end to a close fit in the hole. If the drift sticks, give it a tap sideways. That will shift it.

Next Stage of Perspiration

Cover the joints between crownstay flanges and wrapper with wet flux. Put some more around the smokebox tubeplate flange, and all around the tube ends. Stand the boiler on end, barrel upwards, on something that will bring the tubeplate to about the same height as your brazing pan, to save holding the blowlamp too high. Cut a hole 4½ in. diameter in an old tray, or a big tin lid or something similar, put it over the barrel about five or six inches down and prop it so that it can't slip. Pile up coke or breeze in it, almost to the end of the barrel. If you are inexperienced, it would be advisable to put a wad of asbestos flock or string in the end of each tube, to avoid burning.

Work Round the Joint

Play the blowlamp flame on the coke until it glows red, then heat up the tubeplate. When the flux fuses, concentrate on any point in the tubeplate flange, blow to bright red, and apply some easy-running brazing strip, which will melt and run into the groove. Then gradually work your way right around the joint, feeding in the brazing material until the groove is filled completely. If expense is not a serious consideration, Johnson-Matthey's B6 alloy can be used for this; it is a coarse-grade silver-solder which runs freely at a lower temperature than the strip, but is equally strong. The flame can then be played directly on the tube ends, and when they and the surrounding metal are red, apply silver-solder, either best grade, or Easyflo. This will speedily form a fillet around every tube. If preferred, small pieces can be cut and dropped between the tube ends, and the whole lot will melt and flow at one heat.

Put the boiler quickly in the brazing pan, on its back, with the firebox overhanging the edge, and a weight on the barrel to prevent it tipping up. Lay a strip of silver-solder (any grade) alongside each crownstay flange, and blow from underneath (that is, the top of the wrapper) until it is bright red, then blow inside, along the flanges, until the silver-solder melts and sweats through. The best way by far, to do this job, is to get a mate (an intelligent kiddy does quite well) to hold another blowlamp and play on the outside, while you put the heat on inside. Literally caught between two fires, the silver-solder will run like water. Let cool to black, and carefully put the job in the pickle; mind the splashes Leave it the usual time, then wash off and clean up. Next stage, backhead and foundation ring.

Model Power Boat News

The M.P.B.A. Grand Regatta

by "Meridian"

Mr. K. Hyder (Victoria) with "Slipper 3." the hull of which is of unique design, with a single outrigger plane on the port side to assist getaway

THE Grand Regatta is usually held on the day following the close of THE MODEL ENGINEER Exhibition, and when the fixture list was made it was arranged as usual. When the announcement regarding the change of date of the Exhibition was publicised, it was decided not to change the date already fixed for the regatta.

It was thought that October was too late in the year for a big event, both from the weather aspect, and considering the early onset of darkness at this time of the year.

Record Entry

In recent times there have been very large attendances at the "Grand," and competitors have been required to make entries in advance to assist the task of the organisers. This year, at the start of the regatta, officials reported that there were no less than 135 different boats entered! Straight-running boats accounted for 86 of these entries, and speed boats made up the rest. A few of these entries were scratched during the regatta, either due to mechanical trouble or the competitor failing to arrive, but this made little difference to such a gathering of boats.

Mr. R. Allen (West London) with his steam tug "Conservator," winner of the "M.E." Prototype Cup

There were about 25 affiliated clubs represented at the pondside, including a team of five who had journeyed all the way from Tynemouth. The Portsmouth contingent had provided themselves with blue and white rosettes, which were worn by all members and friends. This seems a good idea, and might be copied by other clubs, although care would have to be taken that colours for each club were different.

Victoria Park was, of course, the venue for this regatta, and Victoria M.S.C. members had erected the enclosure, flags, etc., on the previous day, so that everything was ready for an early start.

The first event was the 75 yard Nomination Race, for free-running boats, and promptly at 10.30 a.m. the first boat made its way down the course, to be followed by an almost endless procession of craft of all types.

Some striking prototype boats took part in this event: in particular, the liner *Zampa* by D. Greenop (Southend) and the liner *Aquitania* by R. Freeth (Tynemouth) attracted much attention by their stately appearance on the water.

Most of the entries managed to complete the course in one clean run, although some boats had to be deflected by the stoppers along the sides of the lake. When this happens, it generally ruins the chance of getting near the nominated time, although it is not unknown for a boat to win after several fend-offs!

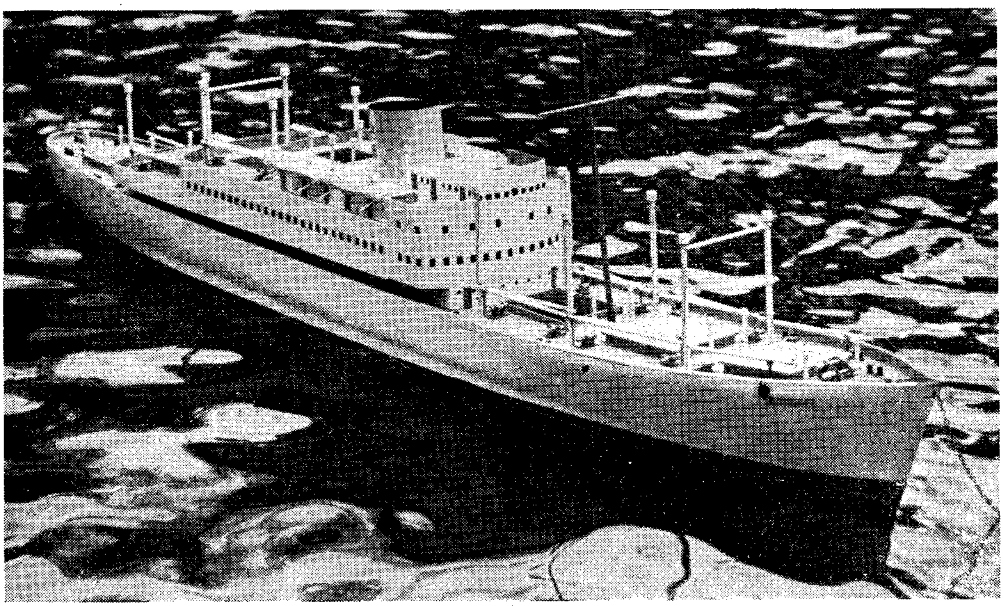
This time, however, there were no such flukes,

for the winner, A. Rayman's *Yvette* (Blackheath) made quite sure by completing the course in exactly the nominated time. There were four prizes to be won in this event, and even the fourth place winner—G. Kirkham (Swindon), with *Kenmor*, was only 1.4 seconds out, giving 2.8 per cent. error. Many other boats were within 2 seconds of their nomination, which shows the keen competition in this event.

when attaining 42.75 m.p.h., which was the winning speed.

G. Lines, with *Sparky* 2, has suffered a mysterious loss of speed recently, and at this regatta it was evident that the performance was below par. Two boats from the recently affiliated Aldershot club took part in this race, but both failed to finish the course.

The Steering Competition for the M.P.B.A. Steering Trophy brought forth a mighty parade of boats in the queue to take a tilt at the targets. Identification of the various craft presents quite a problem to the scorers, especially if the registration numbers are not properly displayed. Most boats *are* well labelled with their numbers, but there are still plenty having no numbers attached, or numbers that cannot be easily seen.



Second in the prototype competition, Mr. D. Greenop's cargo liner "Zampa" (Southend)

A great feature of this regatta was the lack of delay between events. At the conclusion of the nomination, for example, the "C" Restricted competitors were already in the enclosure with their boats ready.

For the speed events, it has to be recorded that Victoria Park was on its worst behaviour. A stiff breeze blew down the lake, and the water was "roughed up." In addition to this, the stirring up of the pond by many pairs of waders contributed more backwash, and in all classes except Class "A" the speeds were low. At the end of the first runs, in the E.D. Trophy race, for "C" Restricted boats, only three boats had completed the course—all at low speed. On the second attempt, C. Hancox (S. London) with *Lady Joan* recorded 46.1 m.p.h., which was a fine performance, considering the conditions. A boat new to Victoria Park, *Bo*, owned by F. Boby (Portsmouth) was second at 40.3 m.p.h., and an unconventional boat by K. Hyder (Victoria) came third.

The Class "B" boats were next on the list, racing for the Mears Trophy, and they fared a little better, since most of them recorded times for the five laps. Speeds, however, were low. and R. Mitchell's *Beta II* (Runcorn) apparently spent more time in the air than on the water

It was expected that the Tynemouth boats would do well in the steering, as the North East Coast clubs have quite a reputation for steering boats of high quality. As it happened, they did not manage to obtain a place but 'it's all in the luck of the game!" A near miss of the bull has lost many a steering contest, and if the luck had gone the other way Tynemouth boats might have gained several places.

W. Hood (Swindon), with *Truant*, was in the lead for some time with a score of 11 points—two bulls and one outer, but one of the later boats proved a "dark horse" and scored two bulls and an inner—total 13 points. This boat was *Squib* 2, by L. Gates (Victoria), a flash-steam launch which has featured in many regattas without a great deal of luck. This score was the best of the day, and represents the first big win for this craft.

J. Chandler (Southend), with *Iope*, was another competitor to score 11 points, and in a re-run, Mr. Hood gained second place. A re-run was also necessary to decide fourth place. Both G. Caird (Bromley) with *B.O.A.C.51*, and F. Preston (Portsmouth) with his launch, scored 9 points each, and in the re-run G. Caird scored 3 while F. Preston missed the target altogether.

Full Results

Nomination Race. 75 *yd.*

(1) A. Rayman (Blackheath), *Yvette* : Error nil
(2) A. Newcombe (Victoria), *Skalet Runner* : Error 0.36 per cent.
(3) D. Greenop (Southend), *Zampa* : Error 2.6 per cent.
(4) G. Kirkham (Swindon), *Kenmor* : Error 2.8 per cent.

E.D. Trophy (" *C* " *Restricted*). 500 yd.

(1) C. Hancox (S. London), *Lady Joan* : 46.15 m.p.h.
(2) F. Boby (Portsmouth), *Bo* : 40.3 m.p.h.
(3) K. Hyder (Victoria), *Slipper* 3 : 38.6 m.p.h.

Mears Trophy. Class " B." 500 *yd.*

(1) R. Mitchell (Runcorn), *Beta II* : 42.75 m.p.h.
(2) G. Lines (Orpington), *Sparky* 2 : 39.1 m.p.h.
(3) T. Dalziel (Bournville), *Naiad* 2 : 39 m.p.h.

Steering Competition for M.P.B.A. Trophy

(1) L. Gates (Victoria), *Squib* 2 : 13 pts.
(2) W. Hood (Swindon), *Truant* : 11 pts. + 5.
(3) J. Chandler (Southend), *Iope* : 11 pts. + 0.
(4) G. Caird (Bromley), *B.O.A.C.51* : 9 pts.

Victory Cup. Class " C." 500 *yd*

(1) R Mitchell (Runcorn), *Gamma* : 41.57 m.p.h.
(2) C. Stanworth (Bournville), *May* : 37.19 m.p.h.

Speed Championship Cup. Class " A." 500 *yd.*

(1) J. Innocent (Victoria), *Betty* : 56.5 m.p.h.
(2) E. Clark (Victoria), *Gordon* 2 : 55.8 m.p.h.
(3) J. Benson (Blackheath), *Orthon* : 51.4 m.p.h.

" M.E." Prototype Cup

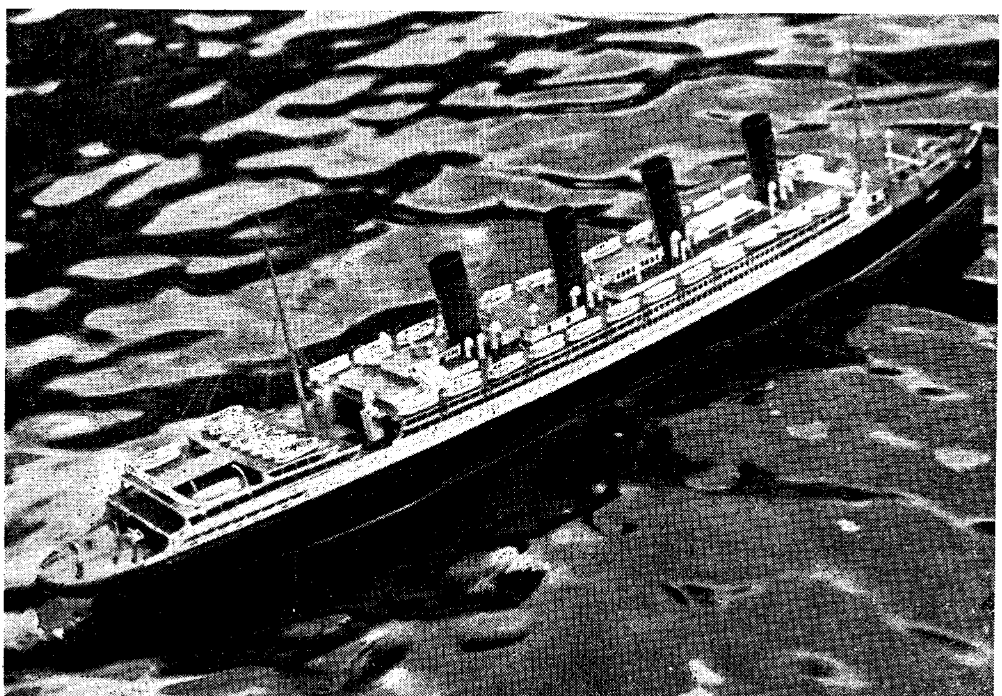
(1) R. Allen (W. London) : *Conservator.*
(2) D. Greenop (Southend) : *Zampa.*

The Crebbin Trophy

B. Pilliner (Southampton) : *Frolic.*

The Class " C " race for the Victory Cup was a repetition of the earlier speed events—only more so! Only two boats finished the course. R. Mitchell with *Gamma* (Runcorn) and C. Stanworth Sen. with *May* (Bournville) were the

(*Continued on page* 443)



Another fine prototype model, Mr. R. Freeth's " Aquitania " (Tynemouth)

Methods of Fixing Pulleys and Flywheels

by A. Smith

THE model engineer, anxious to ensure that his models, especially those of an earlier vintage, are authentic often finds some difficulty in deciding on the correct method of fixing flywheels and pulleys to their respective shafts. It is hoped therefore, that the following notes and diagrams will be of value to such seekers after accuracy.

Proceeding to the more usual methods adopted for larger work, we find steel keys universally adopted. Such keys, illustrated in Fig. 4, have a taper of from $\frac{1}{8}$ in. to $\frac{3}{16}$ in. to the foot. The purpose of the head with which the keys are fitted is made obvious in Fig. 5. The key is driven between wheel and shaft to leave room between the key-head and the face of the pulley

Fig. 1.

Fig. 2

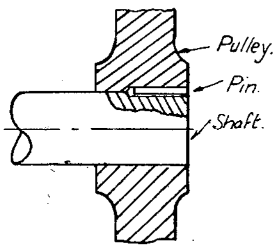


Fig. 3

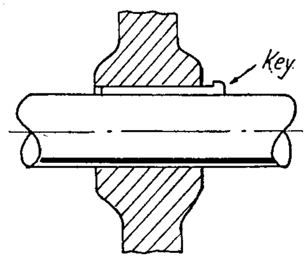


Fig. 5

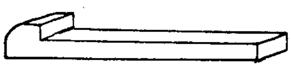


Fig. 4

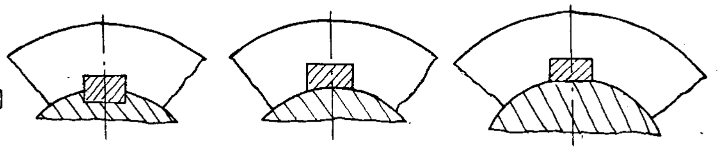


Fig. 6

In light work generally, the split and taper-pins shown in Figs. 1 and 2 are employed as a cheap and handy means of fastening. The pins pass right through the boss and the shaft, the split-ends of the pins being bent over to prevent the pins working out. Unsplit taper-pins are sometimes employed but they are liable to work loose and come out. A pin driven in endwise, half in the shaft and half in the boss, is often employed for light work where the longitudinal location of the wheel is otherwise taken care of. This is shown in Fig. 3.

boss for the insertion of a taper drift for the removal of the key.

In Fig. 6 similar keys are shown, differing only in their individual methods of fitting. The first is the normal method for heavy drives, of sinking the key, half in the shaft and half in the boss. The other two are employed on light drives and are known as "saddle key" and "key on flat" respectively.

When using sunk keys, a sufficiently long key-way must be cut in the shaft to permit the easy insertion and removal of the keys. When such a long keyway is objectionable, the key is often embedded in the shaft as shown in Fig. 7, and the wheel driven on the key.

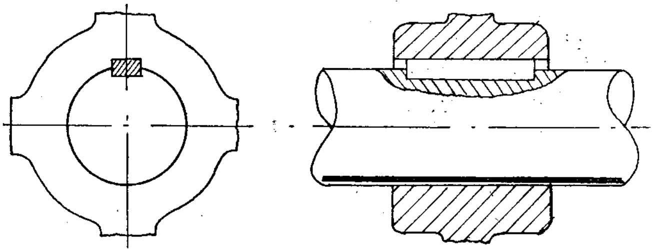
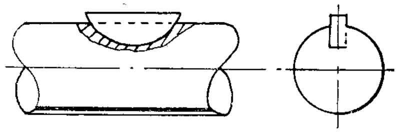


Fig. 7

Fig. 8 illustrates the Woodruff key. The semi-circular keyway is produced by milling with a cutter which itself is termed a Woodruff cutter and of such dimensions as to suit the standard sizes to which such keys are produced.

A special form of keying



Fig, 8

is shown in Fig. 9. Here the full depth of the key withstands the shearing stress, though it is clear that two keys must be used if the shaft runs in both directions. The second diagram shows such keys fitted to an enlarged part of the shaft. The enlargement on the shaft allows the keyways to be cut while

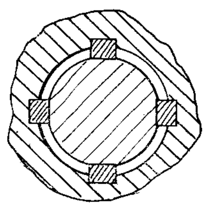


Fig. 10

the diameter at the bottom of the keyways remains identical with the main part of the shaft.

" Staking on " is shown in Fig. 10, which is a method frequently employed in the past for fitting large flywheels to their shafts. It also permits the wheel to pass over a thicker portion of the shaft.

Where it is necessary for the wheel to move longitudinally on its shaft as well as rotate with it, sliding or feather keys are employed. In the first example, Fig. 11, the key is kept in place by the turned pin on the key locating with a drilled hole in the wheel boss. Where such a

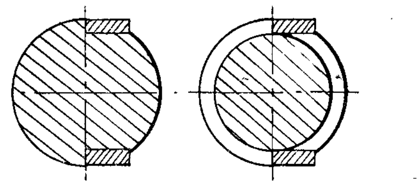


Fig. 9

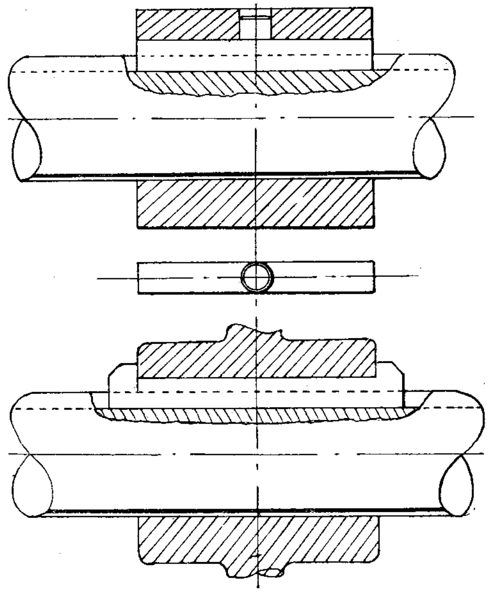


Fig. 11

hole cannot be machined, the key may be double-headed which, after assembly, stops the key from working out of the boss.

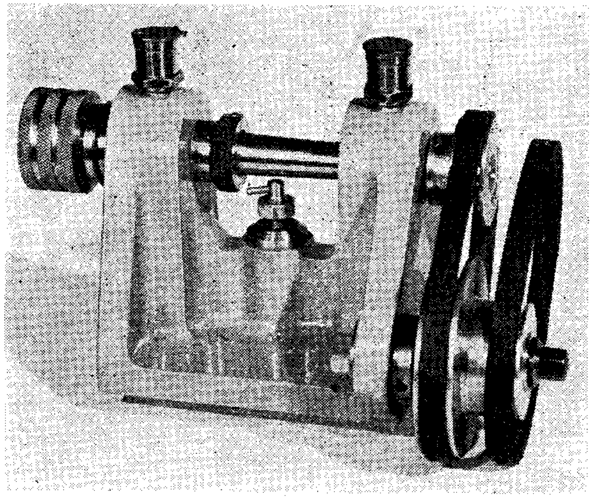
Model Power Boat News

(*Continued from page* 441)

lucky two, and Bob Mitchell pulled off the double by winning this race, as *Beta II* already had won in Class " B." These small craft were not able to plane cleanly, due to the disturbed water, and it was left to the Class " A " boats to make the best showing of the day in the way of speed. The Class " A" race was for the Speed Championship Cup, and the holder, E. Clark (Victoria), was dispossessed of the trophy by J. Innocent (Victoria) with *Betty*. *Gordon* 2 did 55.8 m.p.h. on the best run, but *Betty* managed 56.5—an exciting duel. The highlight of this race was the show put up by B. Pilliner's *Frolic* (Southampton). The rough water caused *Frolic* to bounce in a manner befitting its name, and large parts of the course were covered standing on the propeller !

The " M.E." Prototype Cup Competition was judged during the nomination and steering contests, by Mr. E. Bowness and R. O. Porter, and the winner was R. L. Allen's fine tug *Conservator*, with D. Greenop's liner *Zampa* runner-up. Mr. Allen, although running for the West London club, now comes from King's Lynn, and his journey was rewarded by the winning of this trophy.

A High Speed Auxiliary Headstock



by R. L. Kibbey

HAVING obtained an M.L.7 lathe in place of an M.L.2 of pre-war vintage, the vast improvement in the breed soon became apparent, except in one respect—that of mandrel speed for the turning of small diameters, and in particular, the milling of slots, etc., with the smaller sizes of end-mills. The top direct speed of the M.L. 7 is in the order of 650 r.p.m., and although a higher speed is provided by the makers, giving about 850 r.p.m., any attempt to speed the mandrel up further with the existing bearing design would most probably result in damage to the mandrel and bearings. It is felt that most M.L.7 lathe owners desiring an increased mandrel speed would argue that if higher speeds were possible with the existing machine, they would be provided by the makers. The older lathe referred to above had a drive arrangement giving 1,500 r.p.m. top speed, and no difficulty was experienced in end-milling an accurate slot in mild-steel with cutters down to 5/32 in. diameter.

My first reaction was to accept this speed limitation of the M.L.7 and consider setting up an additional smaller higher speed lathe for the lighter type of work. Apart from the obvious objection of expense, there was the further snag of space required in the workshop to install it and the realisation that the only reasonably-priced high speed lathe had proportionally small swing and slide travels.

This situation led to the designing and manufacturing of the attachment to be described.

Briefly, this attachment consists of a relatively small diameter mandrel running in plain bearings, mounted in a rigid headstock clamped to the M.L.7 bed adjacent to the gap, the method of attachment being similar to that used for the fixed steady.

A pulley (Detail 6) is screwed on to the main mandrel nose which drives, by round or vee belt, a smaller pulley (Detail 7) running on an eccentrically-mounted spindle (Detail 9) secured to the back of the auxiliary headstock.

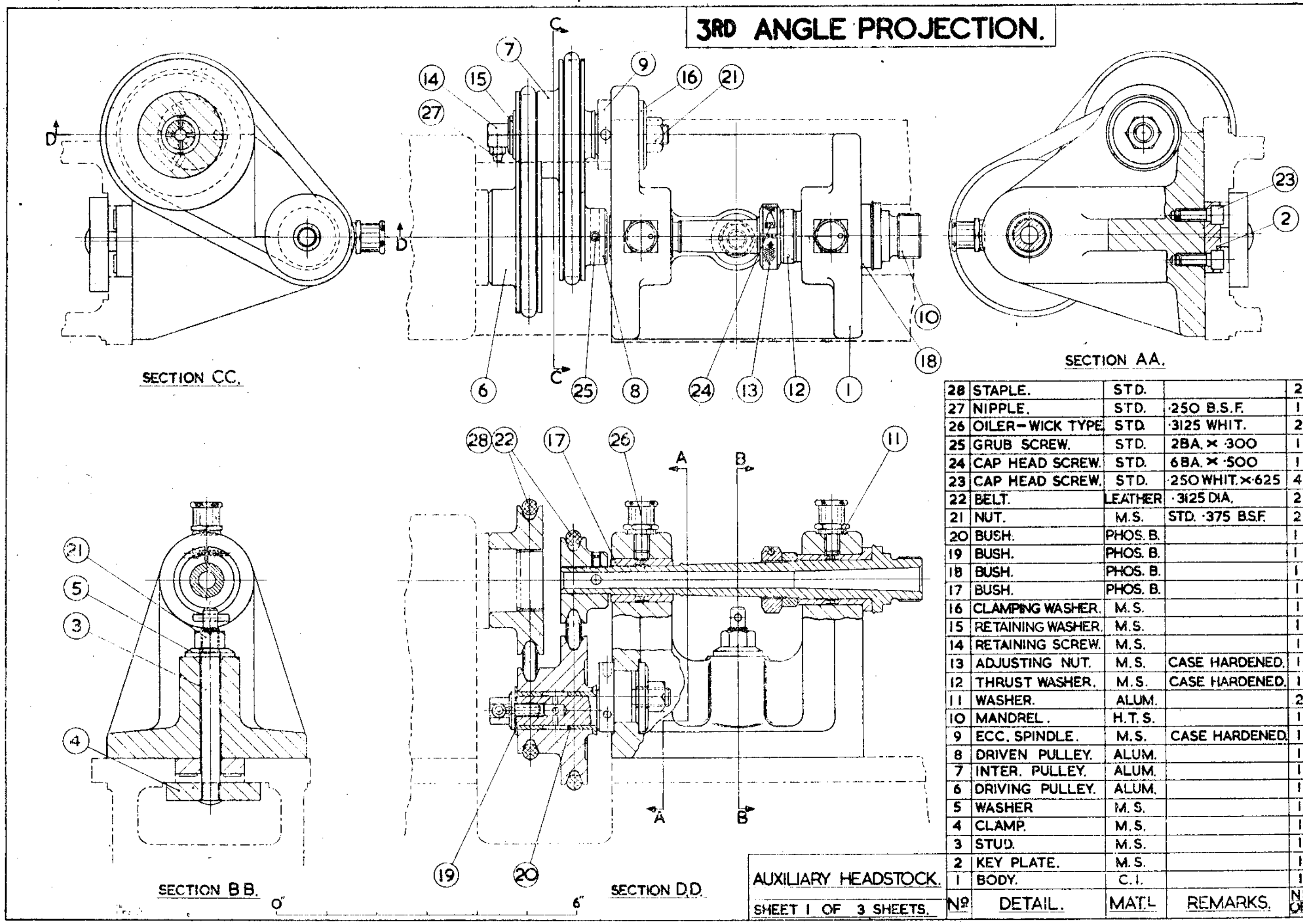
The larger diameter belt groove integral with the smaller pulley (Detail 7) in turn drives the smaller pulley (Detail 8) secured by socket grub-screw to the auxiliary mandrel. It will be found that the sizes of pulleys quoted give a top speed of 2,000 r p.m. to the auxiliary mandrel The mandrel nose is threaded and provided with a register to take a chuck back-plate and bored out to take a No. 1 Morse tapered arbor.

Lubrication of the phosphor bronze bearings is by wick type Rotherham lubricators, and these have been found to give every satisfaction, one fill of the cups providing about one hour's continuous running.

Several split collets have been made to suit the tapered bore of the mandrel, the largest of these being $\frac{5}{16}$ in. diameter.

The two features of this accessory, about which some misgivings were held during the pre-testing stage, were the drive by short belts and the non-adjustable plain bearings. As originally built and as illustrated, the driving belts were made from $\frac{5}{16}$ in. round leather joined by "U" clips. A certain amount of belt slip was experienced until the belts had been soaked in linseed oil and thoroughly stretched. However, since making the drawings, a length of suitable leather "vee" belt has been obtained, and this has been found to give a most satisfactory silent and positive drive, free from slip even under heavy cutting conditions.

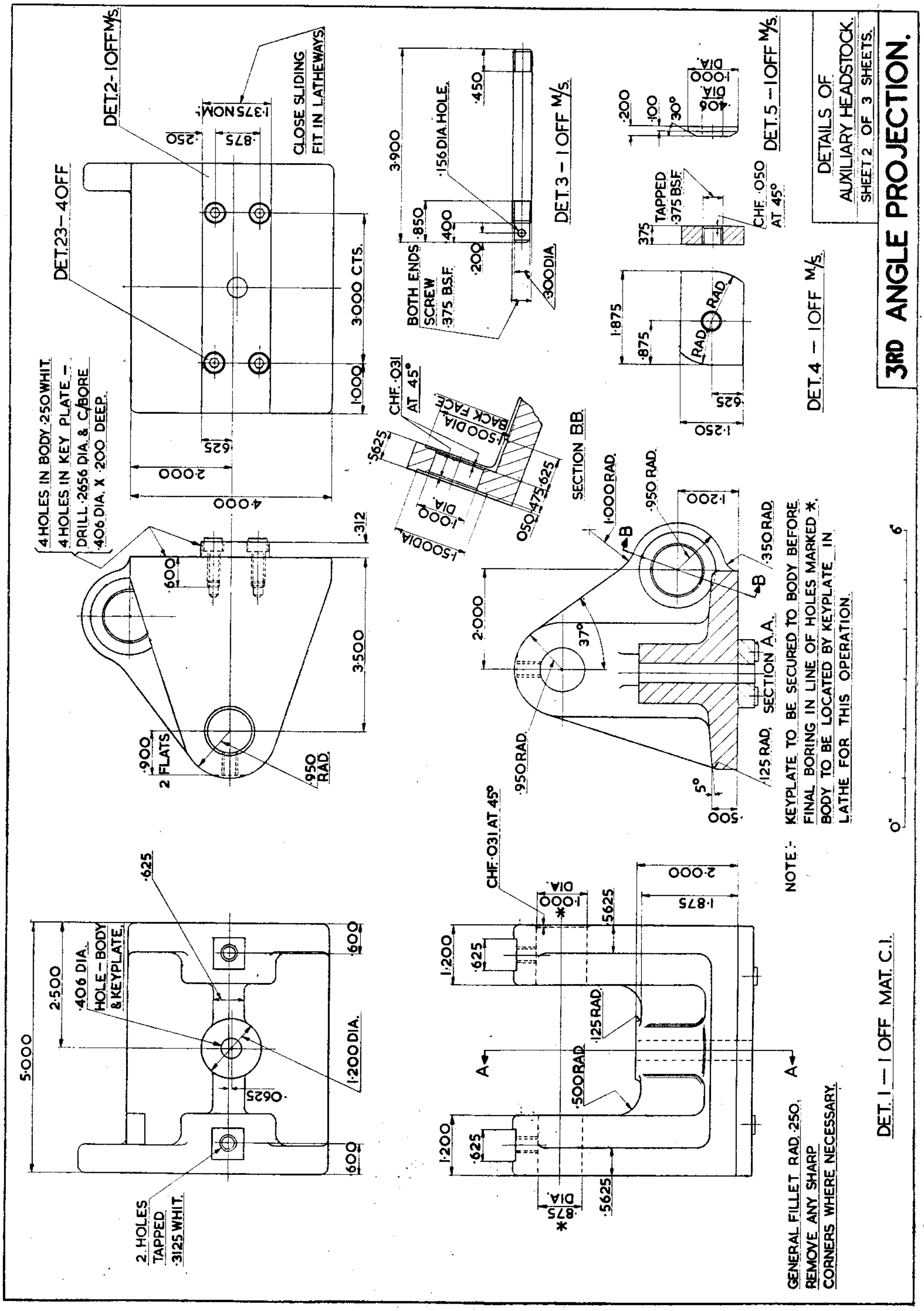
On the choice of bearings, it has been suggested that the lack of adjustment to correct for wear is a disadvantage. The use of plain bushes was decided upon after much consideration. First, it was considered that most of the wear that takes place on the split type of adjustable bearing bush is due to the fact that the bush has been split with consequent interference with a good continuous oil supply. Secondly, it was felt that the comparatively light loading of the bearings, together with the fact that this accessory would only be used for a small proportion of the lathe's service, rendered adjustment unlikely for a long time to come, in which event it would be more satisfactory to lightly clean up the journals on the mandrel and fit new undersize bushes. Thirdly, it was considered that the rigidity

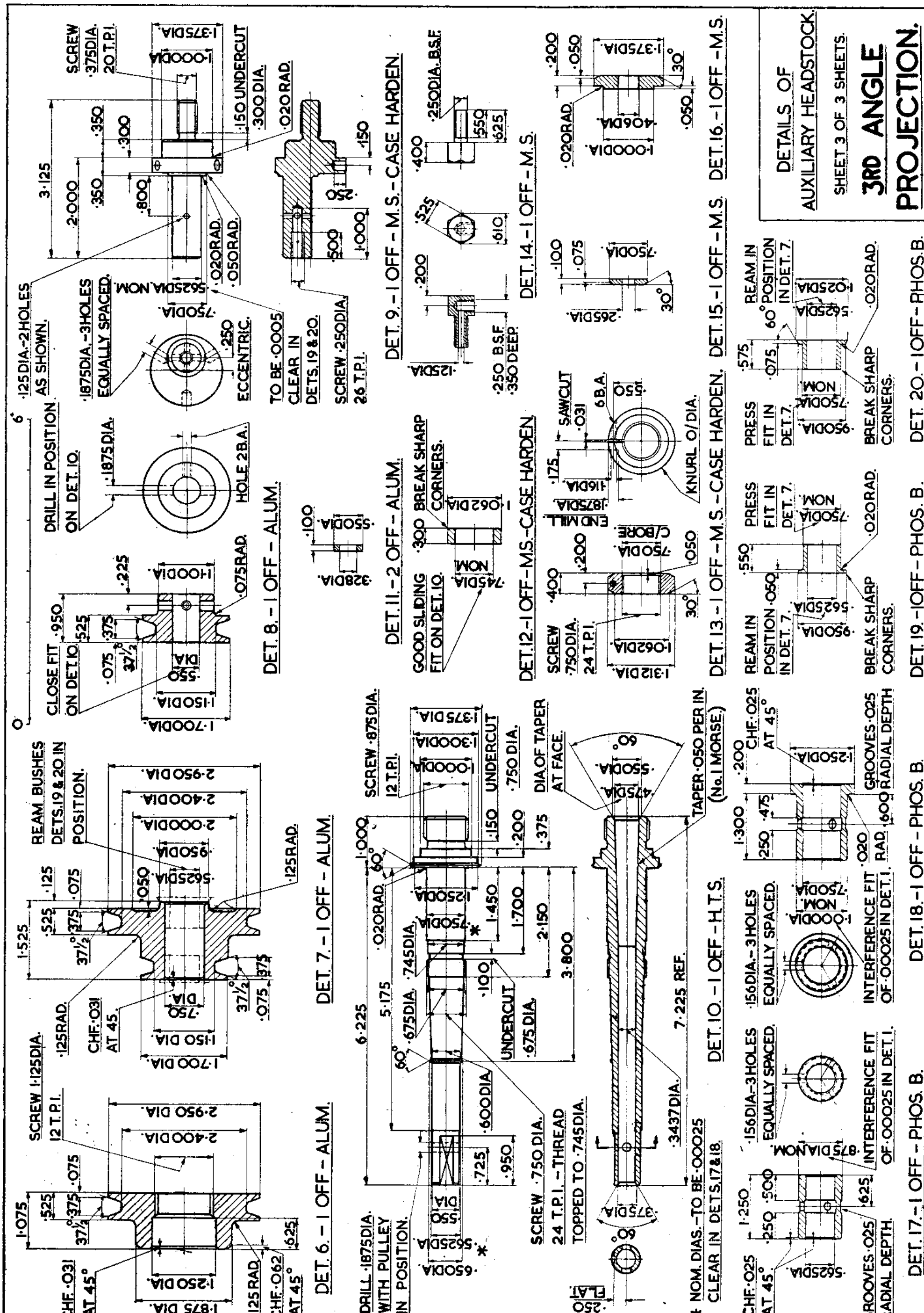


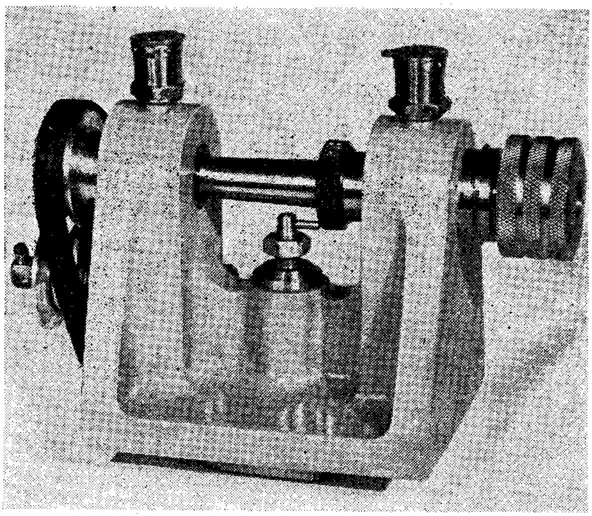
Nº	DETAIL.	MAT.L	REMARKS.	Nº OF.
28	STAPLE.	STD.		2
27	NIPPLE.	STD.	·250 B.S.F.	1
26	OILER–WICK TYPE.	STD.	·3125 WHIT.	2
25	GRUB SCREW.	STD.	2BA. × ·300	1
24	CAP HEAD SCREW.	STD.	6BA. × ·500	1
23	CAP HEAD SCREW.	STD.	·250 WHIT. × ·625	4
22	BELT.	LEATHER	·3125 DIA.	2
21	NUT.	M.S.	STD. ·375 B.S.F.	2
20	BUSH.	PHOS. B.		1
19	BUSH.	PHOS. B.		1
18	BUSH.	PHOS. B.		1
17	BUSH.	PHOS. B.		1
16	CLAMPING WASHER.	M.S.		1
15	RETAINING WASHER.	M.S.		1
14	RETAINING SCREW.	M.S.		1
13	ADJUSTING NUT.	M.S.	CASE HARDENED.	1
12	THRUST WASHER.	M.S.	CASE HARDENED.	1
11	WASHER.	ALUM.		2
10	MANDREL.	H.T.S.		1
9	ECC. SPINDLE.	M.S.	CASE HARDENED.	1
8	DRIVEN PULLEY.	ALUM.		1
7	INTER. PULLEY.	ALUM.		1
6	DRIVING PULLEY.	ALUM.		1
5	WASHER	M.S.		1
4	CLAMP.	M.S.		1
3	STUD.	M.S.		1
2	KEY PLATE.	M.S.		1
1	BODY.	C.I.		1

AUXILIARY HEADSTOCK.

SHEET 1 OF 3 SHEETS.


3RD ANGLE PROJECTION.
DETAILS OF AUXILIARY HEADSTOCK.
SHEET 2 OF 3 SHEETS.
DET.2 - 1 OFF M/S.
CLOSE SLIDING FIT IN LATHEWAYS.
DET.23 - 4 OFF
DET.3 - 1 OFF M/S.
·156 DIA. HOLE.
BOTH ENDS SCREW ·375 B.S.F.
·300 DIA.
DET.5 - 1 OFF M/S.
TAPPED ·375 B.S.F.
CHF. ·050 AT 45°
DET.4 - 1 OFF M/S.
CHF. ·031 AT 45°
BACK FACE
SECTION BB.
4 HOLES IN BODY ·250 WHIT.
4 HOLES IN KEY PLATE - DRILL ·2656 DIA. & C/BORE ·406 DIA. X ·200 DEEP.
SECTION A.A.
2 FLATS
NOTE:- KEYPLATE TO BE SECURED TO BODY BEFORE FINAL BORING IN LINE OF HOLES MARKED *. BODY TO BE LOCATED BY KEYPLATE IN LATHE FOR THIS OPERATION.
·406 DIA. HOLE - BODY & KEYPLATE.
1·200 DIA.
2 HOLES TAPPED ·3125 WHIT.
GENERAL FILLET RAD. ·250. REMOVE ANY SHARP CORNERS WHERE NECESSARY.
DET. 1 — 1 OFF MAT. C.I.


DETAILS OF
AUXILIARY HEADSTOCK.
SHEET 3 OF 3 SHEETS.
3RD ANGLE
PROJECTION.
DET. 6.-1 OFF - ALUM.
DET. 7.-1 OFF - ALUM.
DET. 8.-1 OFF - ALUM.
DET. 9.-1 OFF - M.S.-CASE HARDEN.
DET. 10.-1 OFF -H.T.S.
DET. 11.-2 OFF - ALUM.
DET. 12.-1 OFF-M.S.-CASE HARDEN.
DET. 13.-1 OFF -M.S.-CASE HARDEN.
DET. 14.-1 OFF - M.S.
DET. 15.-1 OFF - M.S.
DET. 16.-1 OFF - M.S.
DET. 17.-1 OFF - PHOS. B.
DET. 18.-1 OFF - PHOS. B.
DET. 19.-1OFF - PHOS. B.
DET. 20.-1OFF - PHOS. B.
* NOM. DIAS.-TO BE .00025
CLEAR IN DETS. 17 & 18.



provided by solid bushes in a robust casting having no split was an advantage well worth retaining.

At the time of writing, this device has run for a total of approximately 70 hours, four of which, as a test, were done continuously at top speed and with only three refills of the wick lubricators being necessary.

The performance of this accessory has more than come up to expectations. By careful setting of the tool to centre height, no difficulty is experienced in reducing $\frac{5}{16}$ in. diameter silver-steel to 0.015 in. diameter at one cut, and the same material can be smoothly parted-off using a tool 3/32 in. wide, in top speed. The finish is, of course, very good, as one would expect at the relatively high speed used.

Using a $\frac{1}{8}$ in. diameter taper shank end-mill, slots $\frac{3}{16}$ in. deep in mild-steel have been produced at one cut without any measurable wander from straight, certainly equal in quality to slots produced by a similar width of Woodruff cutter used at normal lathe speed. It will probably be agreed by all users of small lathes that end-milling lends itself to use on the lathe far more than side or side and face cutting.

The manufacture and construction of this unit is quite straightforward and it is only proposed to make mention of any unorthodox methods used in producing the prototype The headstock casting has a separate key-plate secured to the base by four Allen socket-screws, thus enabling the base to be machined truly flat. Having cleaned up one end face, the base was machined by securing the casting to the cross-slide and fitting a specially made silver-steel fly-cutter into one of the slots in the lathe faceplate, the cutter working at 7 in. diameter. The traverse of the cross-slide was found sufficient to clean up the whole facing, except for two corners, which were afterwards filed and scraped flush. The key-plate was made next to be a good fit in the lathe ways, and was firmly secured to the base of the casting by four $\frac{1}{4}$ in. Whitworth Allen cap-screws. The next operation was to bore out the headstock to take the mandrel bearing bushes.

Having checked the truth of the tailstock centre, a boring bar carrying two suitably-spaced fly-cutters was set up to pass through the cored holes in the casting which—located by the key-plate—was placed in position on the lathe bed. The lathe saddle was brought up behind the casting, so that the felt pad retaining-screws on the saddle contacted the casting, by engaging the automatic feed, both hands were then free to press the casting down firmly on the lathe bed as it traversed over the boring cutters. About $\frac{3}{16}$ in. of metal had to be removed from the bearing bush bores, and this was effected in about six traverses, the final cut being only two or three-thous. deep. Experiments showed that a depth of cut of about 0.030 in. could be taken without the casting lifting from the lathe bed. Subsequent checking of the truth of the bores by a Verdict dial gauge held in the 3-jaw chuck proved them to be accurately in line with the lathe centres.

The bushes were next produced and carefully finished to an interference fit of $\frac{1}{4}$ to $\frac{1}{2}$ thous. in the bores of the casting, being then pressed into position by means of a bolt and suitable large washers. The slightly tapered arbors on which the bushes had been mounted to finish the outside diameters were then used as gauges to determine the sizes to which the mandrel journals were to be finished. The mandrel itself proved to be quite straightforward in manufacture.

A suitable length of good quality mild-steel was held in the 3-jaw supported by fixed steady and bored out from each end to $\frac{3}{8}$ in. diameter and, of course, carefully centred. All the remaining operations were then carried out between centres, except, of course, for the taper in the bore, which was produced with the mandrel assembled in its own headstock and driven by a lathe driving-dog fixed to the tail end.

The completed headstock is very quickly fitted to, and removed from, the lathe. The $\frac{3}{16}$ in. diameter hole drilled through the mandrel and mandrel pulley takes a small tommy bar to prevent rotation when removing the collet nut or chuck.

The small tommy bar in the end of the main clamping-stud is fitted in line with the major axis of the clamping plate and ensures that the plate is making full contact with the underside of the lathe ways before tightening the clamping-nut. It has also been found advisable to slacken off the final driving belt when the device is not in use to guard against uneven stretch of the belts, as there is, of course, no independent adjustment of the two belts. It may be that in time unequal stretch will take place, but this can easily be corrected by the shortening of one belt.

A Complete Flexible Drive Unit

by J. B. Clegg, A.M I.P.E.

THE cone pulleys for both motor and countershaft were turned from billets of aluminium alloy cast in moulds of steel tubing. Scrap metal can be melted in a ladle with a blowpipe and plenty of coke, or even on the domestic fire with suitable stoking. Any bits of light alloy may go in the melting pot, including scraps of sheet or bar, and if a little zinc base alloy is added, the mixture will flow more readily. Zinc base alloy is commonly used for mass-produced castings such as are so often found in household goods and toys—a hint for family men to call on their resourcefulness when hoarding scrap. The steel tubing moulds only required the bores cleaning of dirt, squaring at one end to stand on flat plates and de-burring internally. Such moulds will not leak, as the metal is not sufficiently fluid to run out after contacting the mould. When the casting solidifies, it may be cooled in a bucket of water, the resulting contraction will then be sufficiently greater than that of the steel to allow it to fall out merely by shaking the mould. The high running speed of these pulleys demands accurate machining for concentricity, and it is worth while to turn mandrels, with the tailstock set over for a slight taper, on which to turn them. The billets are first drilled through in the three-jaw chuck and finish bored (or reamed) to fit on bars the same diameters as motor spindle and countershaft respectively. The mandrels are then turned so that the small ends enter the bores and are forced in until their tapers hold securely. Assuming that a mandrel press is not available, the small end of each mandrel may have an extension turned to any diameter which can be threaded with screwing tackle, so that the billets may be safely forced on by means of sleeves and nuts. The grooves are turned to suit a vacuum cleaner belt which is easily obtainable and makes an ideal primary transmission. Fig. 21 shows the arrangement of the primary drive and the flexible shaft in its fixing which is attached to the baseboard by a simple angle bracket. A photograph of the actual unit is reproduced in Fig. 24.

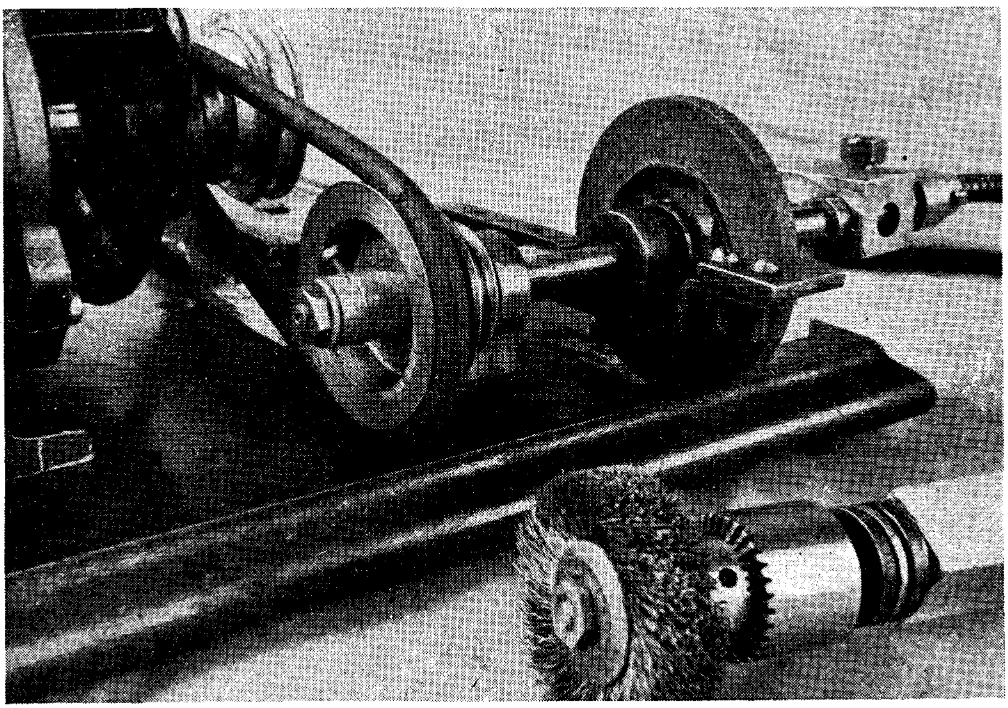


Fig. 24 *Primary Drive*

Continued from page 400, " *M.E.*," *September* 25, 1952.

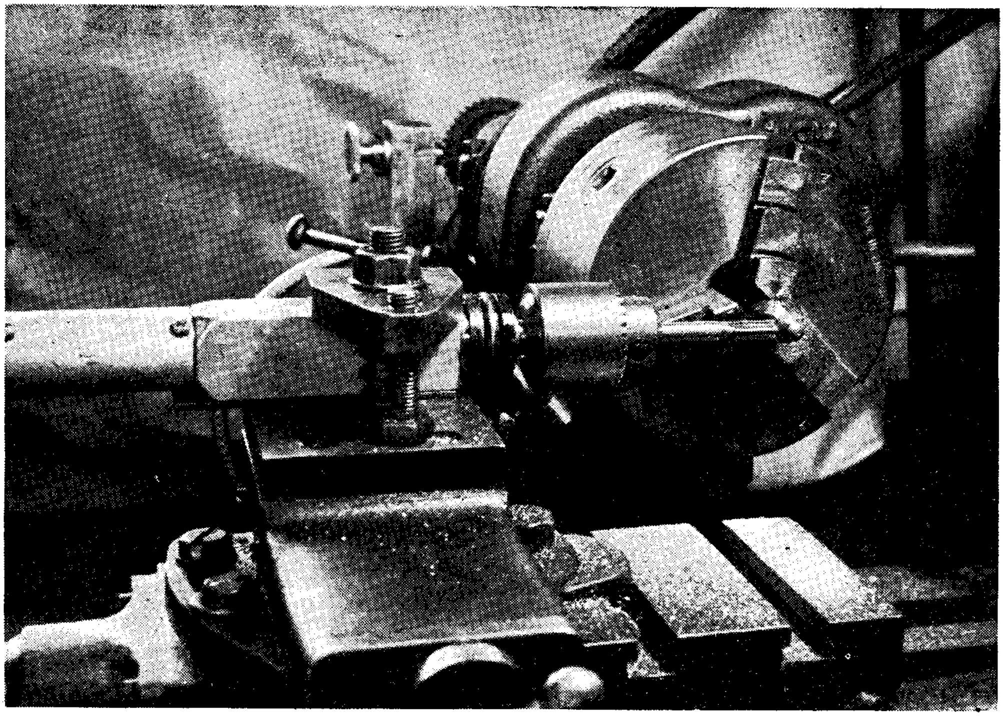


Fig. 25. Set-up for end-milling

A Versatile Outfit

The $\frac{1}{4}$ in chuck enables the spindle to be used in a wide range of drilling and end-milling operations In Fig. 25 the spindle is seen fixed in the tool holder milling a square on a turned component mounted in the three-jaw chucking. In this photograph an indexing device is visible. An adapter is fixed in the rear of the headstock mandrel. Turned to fit in the mandrel then split, the adapter is fixed by means of a bolt and draw cone, whilst its other end carries a change wheel by means of a nut. A spring-loaded plunger, carried in a support fixed on the gear case, engages with the change wheel, thus holding the mandrel against revolving. A 40-toothed wheel was used for milling the square, a 10-teeth movement giving a quarter revolution.

The same indexing device was used in the drilling operation illustrated in Fig. 23 (see cover picture for the September 25th issue), the wheel this time being moved five teeth each turn. After scribing the pitch circle on the work, a centre drill was used to start the eight holes before proceeding with the actual drilling operation.

Small grinding wheels mounted on arbors may be held in the chuck for using as a toolpost grinder. When the flexible drive cannot be accommodated on the left, it is used on the right and the work to be ground is revolved with the lathe motor in reverse.

As a portable hand grinder and polisher the spindle has many uses at the bench, operating abrasive tips, small wheels, buffs and brushes. Such a diversity of uses make the change speed primary drive very desirable, the high speeds being essential for grinding and polishing, whilst drilling and milling require much lower speeds.

In conclusion, I should mention the assistance given, both in the workshop and in preparing this article, by my junior partner, aged 16 years. In addition to being the main force in the raising of such criticisms as mentioned in my opening paragraph, he is largely responsible for the illustrations appearing herewith.

Price List Received

We have received from Kennion Bros. (Hertford) Ltd., a copy of a new price-list of taps, dies, die holders, tap wrenches, boring bars, twist drills, rods, wires, metal sections, tubes, lathes, small tools and a number of useful materials and accessories for the home workshop. We find the prices are as reasonable as can be expected; some of them are surprisingly so, considering present conditions.

A copy of the list will be sent on receipt of 3d. in stamps. The address of Kennion Bros. is 2 and 2a, Railway Place, Hertford, Herts.

The Allchin "M.E." Traction Engine

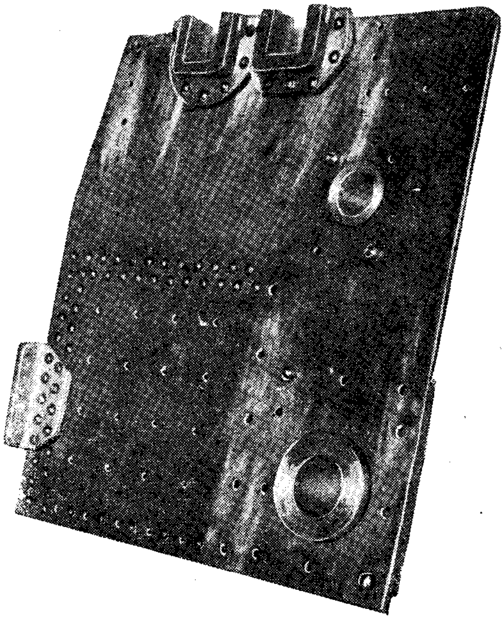
to $1\frac{1}{2}$-in. Scale

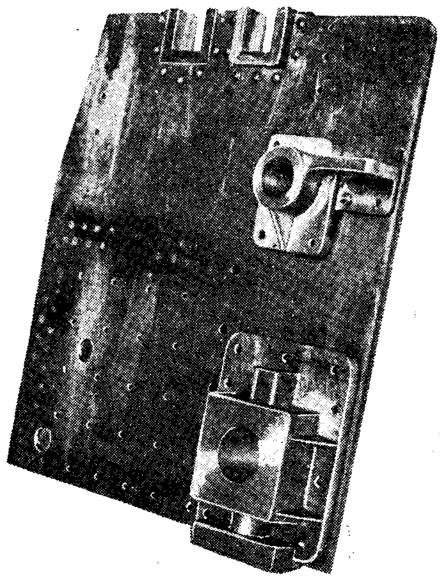
by W. J. Hughes

THE brackets for the crank and second shafts may be fitted to the hornplates first. The slots in the latter should be very carefully eased out with a smooth file until the inner spigots of the brackets just fit into them. Take your time over this job: remember that if the fitting is very good, there will be *no* shearing stress on the rivets, whereas if the fit is sloppy, the rivets will have to take all the considerable pull and thrust of the piston. Remember, too, to keep the centres of the brackets correctly centred up with the centre-lines of the shafts.

Photograph No. 15 shows the outside of the left-hand hornplate with the brackets in position, and Photograph No. 16 the inside of the right-hand hornplate. It will be noticed that the upper brackets stand proud of the top of the hornplates: the surplus will be machined off when the brackets are being slotted out for the bearing-bushes.

To fit one of the upper brackets, clamp it in position with a tool-makers' clamp, and drill the central hole under the crankshaft bracket through the flange, using the corresponding 3/32-in. hole in the hornplate as a jig. Insert a 3/32-in. cup-head iron rivet from the outside, and head it over on the inside, using rivet-snaps, of course. Next, drill the central hole under the second-shaft bracket, and insert a rivet here.





Photos by] [*The author*

Photograph No. 15. *The outside of the left-hand hornplate, showing the brackets and dummy firebox rivets in position*

Photograph No. 16. *The inside of the right-hand hornplate, showing the brackets fixed in place. Note pump platform integral with third-shaft bracket*

Now insert the foremost rivet, which will need to be a longer one because it passes through the boss which carries the dummy adjusting-screw. Then put in the hindmost rivet, and the two central ones between the spigots. Finally, drill for and insert the remaining rivets, one at a time.

Fixing the Third Shaft Brackets

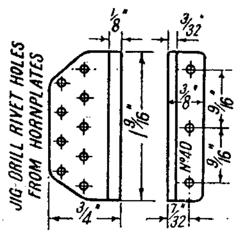
The brackets for the third shaft are fitted very similarly, except that 7-B.A. screws and nuts are used instead of rivets. See that the long edges of the flanges are vertical before clamping in position, of course, and that the pump-platform is horizontal. Jig-drill the holes one at a time through the hornplate, and insert the screw before drilling the next. For the time being, round-headed or cheese-headed screws will suffice, but in the final assembly—some time away as yet, of course!—hexagon head *must* be

Continued from page 314, "*M.E.,*" *September* 4, 1952.

used. Nothing looks worse on a model than "screwdriver" screws where they shouldn't be!

The Hind Axle Brackets

I am sorry that an error has crept in to the preceding instalment—possibly the result of writing it by the briny instead of in the more prosaic atmosphere of home. It concerns the lengths of the outside spigots of the hind axle brackets, given in that article as ¼ in. long. Please note that, as I stated in THE MODEL ENGINEER dated May 24th, 1951, the left-hand spigot should be extended by 3/16 in., and the right-hand one by ⅛ in.; that is, they should be 7/16 in. and ⅜ in. long respectively.



Angle-brackets for the steerage—do not drill the three bolt-holes at this stage

If, however, you have already turned them to ¼ in., the castings needn't be scrapped; you can bore and part off a couple of suitable washers from steel or brass to make up the difference. There will be ample bearing surface in the brackets for the hind axle.

Another regrettable error concerns the spectacle plate, the bottom edge of which should be radiused out to 1⅞ in. instead of 1¾ in. This will involve a spot of bother in removing and rebending the curved angle, as well as filing the surplus ⅛ in. from the curve of the plate itself. I do apologise most sincerely for this, but to those who have to undertake the alterations it may be some slight comfort to know that the culprit himself has to do the same; and serve him jolly well right, say you!

Fixing The Hind Axle Brackets

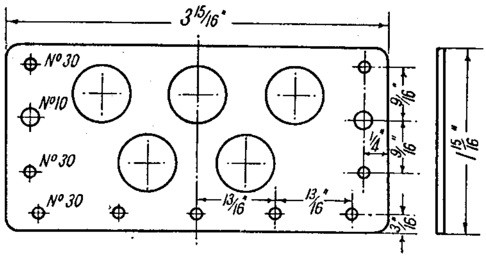
No special remarks are called for with regard to fixing the hind axle brackets, because these are fitted in the same way as those for the third shaft. But do take care that the brackets are properly square with reference to the edges of the hornplates. The screws are ⅛-in. or 5-B.A.

The Steerage Angle-Brackets

In Photograph No. 15, you will see one of the angle-brackets for the steerage riveted in position. With these brackets it is only necessary to clean up the castings by filing, but, of course, it is essential with each that the front surface and that which fits to the hornplate are not only straight and true, but are square with each other. Otherwise, when the brackets which carry the steerage shaft itself are fitted, the bearing-holes for the shaft will be out of alignment and the shaft will bind in them.

From the front edge of the horn-plate, square a short line 1 1/16 in. from the bottom, and another 1 9/16 in. above that. The bracket fits between these lines. Now set dividers or oddlegs to ⅛ in., and scribe a line on the side of each bracket at that distance from the front edge. Clamp the bracket in place so that this line is level with the front edge of the hornplate, and drill the centre-hole in the front row through the corresponding 3/32-in. hole in the hornplate.

Remove the bracket, and countersink the hole on the *inside* of the hornplate. In fact, while you are countersinking, you could do ditto for all the holes which are marked with a cross in the drawing of the hornplate ("M.E." dated June 12th), as well as for those which are to hold



Cross stay for the hind axle bearing brackets

the steerage brackets. These nine should be countersunk to about 5/32 in. diameter, but the others need only be made about ⅛ in. wide over the countersink, because they only carry dummy rivets and nothing else.

Replace the bracket in position, and insert the rivet in the holes. Cut off any surplus, and form the countersunk head on the inside—but do not rivet too tight at the moment. If the bracket has slipped askew, straighten it, and refix the clamp. Drill one of the outer holes in the back row; insert and head the rivet. Remove the clamp, and complete the tightening of the centre-rivet. Now drill for and insert the remaining rivets one at a time, heading each over as you go, and working from the outside holes inwards.

When the steerage-brackets are fitted, and while the tools are handy, you can also insert the dummy rivets, round head on the outside and countersunk inside. As you will gather, these rivets do not serve any really useful purpose in the model, but they are there in the prototype and will make a great deal of difference to the appearance of our finished Allchin!

When they are all fitted, of course, they should be filed off flush on the inside—Photograph No. 16 was taken before this had been done, actually.

By the by, one point I forgot to mention: on the drawing of the steerage-bracket, three No. 40 holes are shown on the forward-facing flange. It will be better *not* to drill these yet; they can be jig-drilled from the brackets for the steerage-shaft, when we come to them.

Cross Stay for the Bearing Brackets

As I mentioned in an earlier instalment, we are further strengthening the box-formation of

(*Continued on page* 456)

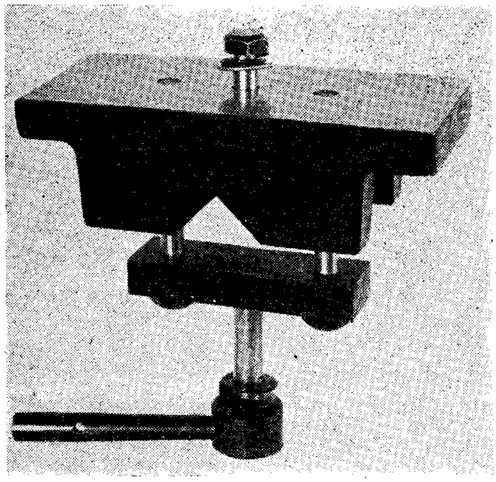


Fig. 20. The upper V-block and stirrup

Making a Workshop Camera

by

" Dioptre "

TO complete the mounting for carrying the bar bed, another V-block is required. This upper V-block *M*, shown in Fig. 11, is inverted so that the bar bed is gripped between it and the lower V-block *J*, Fig. 12.

Continued from page 373, " *M.E.*," *September* 18, 1952.

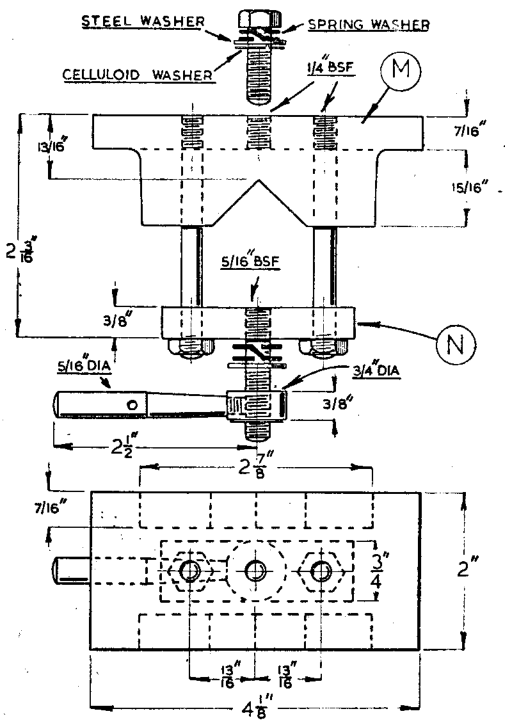


Fig. 21. Constructional details, " M "—upper V-block ; " N "—stirrup

The Upper V-Block Assembly—M, Fig. 21.

It will be seen that the dimensions of this part are the same as those for the lower V-block *J*, described in the previous article. In addition, the upper face is drilled and tapped to take the hexagon-headed screw that secures the bellows fork *P*, Fig. 4.

A stirrup *N* is also fitted, and its draw-bolt passes through both the lower V-block and the table *H*, so that, when the clamp lever is tightened, the bed is firmly held ; by this means, too, the bed is enabled to slide in its mounting.

It will be noticed that the clamp handle is made detachable and is drilled with a tommy

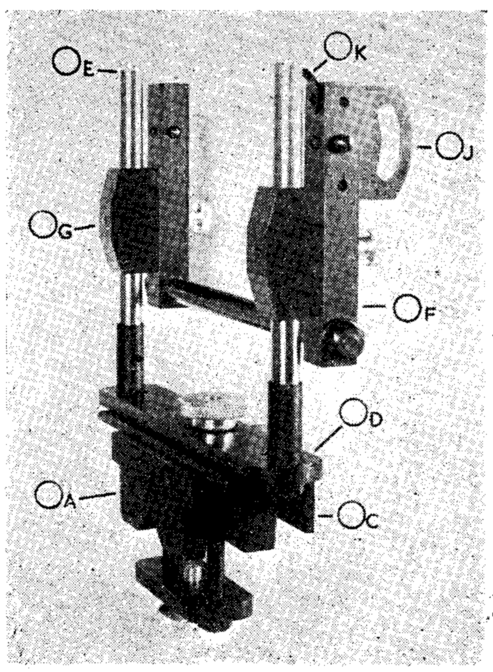


Fig. 22. The front slide assembly. " Oa "—V-block ; " Oc "—cross-slide ; " Od "—fork base ; " Oe "—fork upright ; " Of "—vertical slide side-member ; " Og "—slide bearing blocks ; " Oj "—quadrant plate ; Ok "—index

hole ; this is to allow the nut portion to be first assembled and the handle afterwards screwed into place, for the clamp lever is too long to make a full turn without fouling the base bracket.

The remaining fittings mounted on the bar bed are for carrying the camera proper and are designed to furnish all the necessary camera movements.

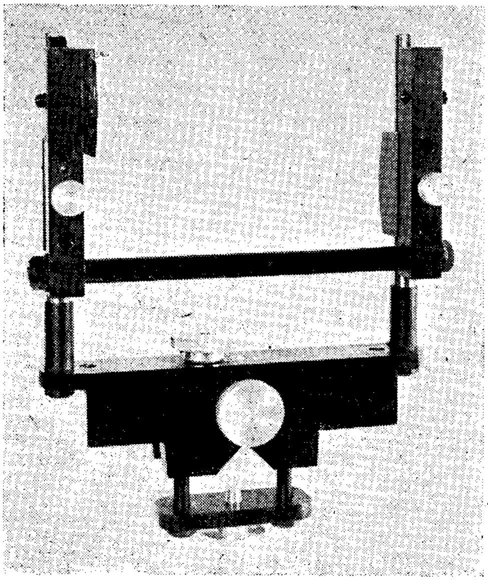


Fig. 23. The front slide

The Front Slide Assembly—O, Figs. 4 and 22.

Here, again, a V-block sliding on the bed is secured by means of a stirrup and clamping-screw. As shown in the drawing, the front face of the V-block is recessed to accommodate the cross-slide *Oc*.

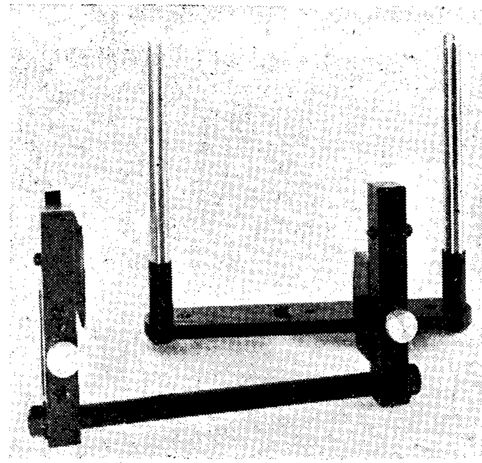


Fig. 24. The vertical slide and front fork

The Cross-slide

The cross-slide, made from stee angle, has a lateral movement of 2 in. and is secured by means of a knurled, duralumin finger screw. An index mark is made on the slide to show its central position. The upper surface of the slide carries a fixed pivot for the bellows front fork, and also a threaded stud for the finger nut securing the slotted fork base *Od*.

In this way, provision is made for swinging the fork, and with it the camera front, over a wide range.

The Vertical Slide

To the fork base are secured two uprights *Oe* made of round steel rod, and on these slide the two bearing blocks *Og*. These blocks are fixed to the vertical slide *Of* carrying the front panel of the camera. This arrangement provides for raising and lowering the camera front, and

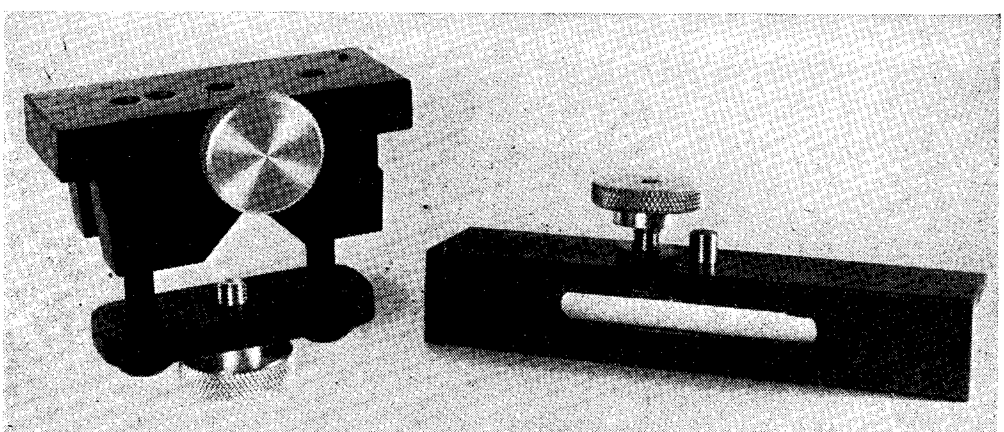
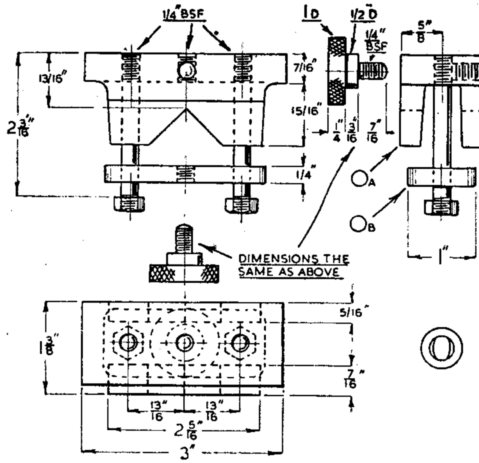
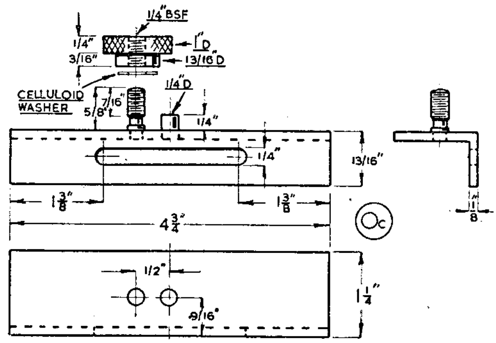


Fig. 25. Front slide V-block and cross-slide



Left—Fig. 26. *Details of front slide V-block and stirrup*

Below—Fig. 27. *The cross-slide*



thimbles are fitted to the fork uprights to limit the downward movement.

It will be seen that, in order to control the rise and fall movement, coil springs and pressure pads are fitted under the small finger screws clamping the vertical-slide to the fork members. By fitting a tie-bar *Oh*, the construction of this slide is made quite rigid. For setting the rise and fall front, a small pointer *Ok* is attached to the slide, so that, when this index is level with the top of the fork, the lens lies on the centre-line of the camera.

The Tilting Front

The camera front is made to tilt upwards or downwards about the camera's optical axis; this is a better arrangement than that sometimes found, where the camera front is pivoted towards

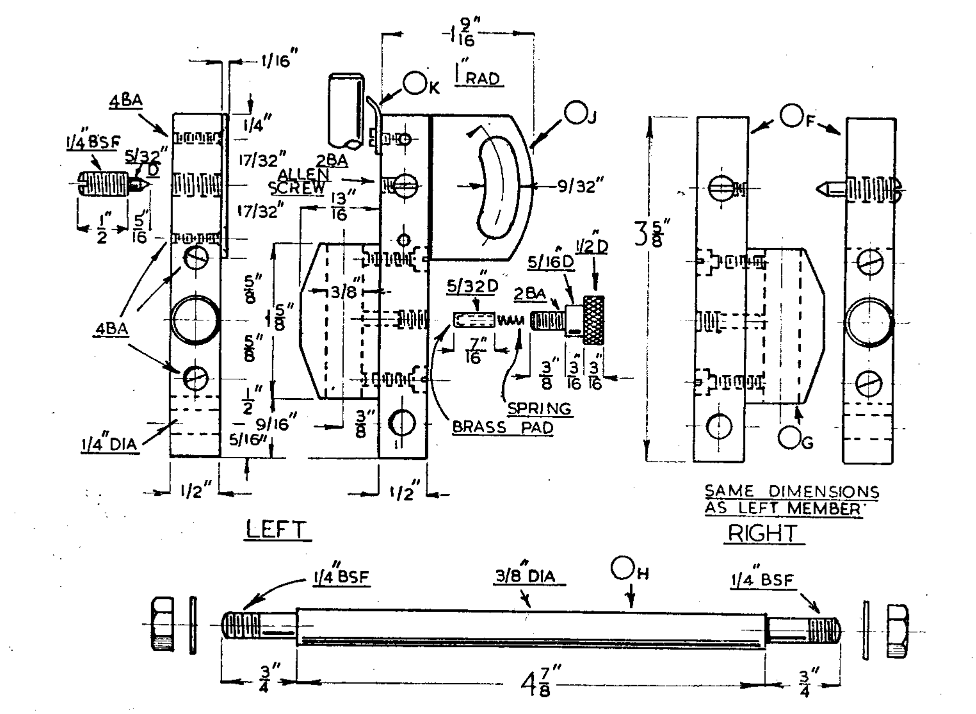


Fig. 29. *Details of the vertical slide*

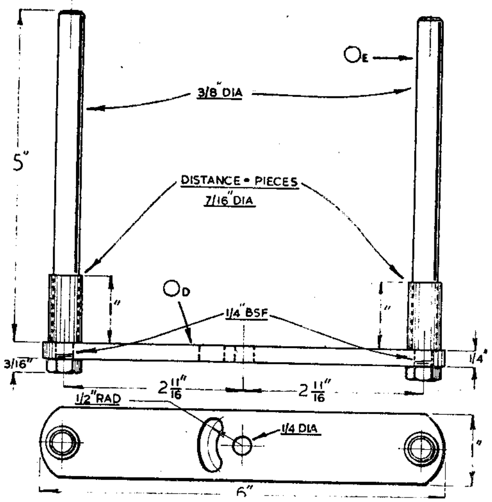


Fig. 28. The front fork

its lower edge. The pointed, adjustable pivot-screws are carried in the side members of the vertical slide, and engage in small sheet-metal plates attached to the woodwork of the camera front. These plates also carry a stud for the finger clamp-nut locking the tilting movement, but they will be described at a later stage, as they form part of the camera's front panel. The pivot screws are locked after adjustment by means of Allen grub-screws.

To lock the tilting movement, a slotted quadrant plate *Oj* is attached to the right-hand side-member of the vertical slide.

This completes the construction of the front slide assembly and, as will be seen, a full range of movements is provided, but some of these can be omitted by those wishing to simplify the construction.

For example, a rise and fall front is hardly necessary if the tilting front and back are used, instead, for maintaining the vertical lines of the subject in parallel alignment.

In the same way, the swing front and back can be employed in combination as a substitute for the cross front. However, it is better to have too many movements rather than too few.

In the next instalment, the mounting for the camera proper will be completed by describing the fitting of the bellows fork and the back slide with its fine-focusing mechanism.

(To be continued)

The Allchin "M.E." Traction Engine

(Continued from page 452)

the hornplate structure by fitting a cross-stay between the bearing-brackets for the hind-axle. This stay, made from 13-g. mild-steel sheet, will be clamped between the dummy springs and the "feet" of the brackets, and its front edge will be bolted to an angle riveted to the bottom edge of the firebox front. (As I have also mentioned before, this is what locomotive fans would call the "backhead.")

After filing the plate square and to size ($3\frac{15}{16}$ in. $\times 1\frac{15}{16}$ in.), the holes may be set out and drilled to the dimensions given in the drawing. The No. 30 holes are to clear $\frac{1}{8}$-in. or 5-B.A. screws, and the No. 10 to clear $\frac{3}{16}$-in. screws.

The purpose of the five larger holes, shown $\frac{5}{8}$ in. diameter, is not to lighten the machine—a few ounces is neither here nor there on a traction-engine !—but to prevent the collection on the plate, in any quantity, of coal-dust which may percolate through from the footplate. Otherwise we might easily have the situation which occasionally happened with full-sized traction-engines, where debris, mostly chaff and coal-dust, mixed with oil from the bearings or grease from the gears, caught light under the footplate or in a gear-case, and caused damage which was not always only confined to blistered paint !

However, the holes need not be any larger than $\frac{1}{2}$ in diameter, if that is the largest your machine will drill. Just thought I'd mention it, because some tyros imagine that if they make the slightest alteration to a published design, some terrible and unimaginable calamity will befall !

The Allchin to 2-in. Scale

I have received a very nice letter from Mr. Robert Cochrane, of Dunedin in New Zealand, who tells me that he has started to build the Allchin in 2-in. scale. As he raises a point of general interest, I will answer it here, although I have already replied to him separately.

The point concerns the scaling-up from $1\frac{1}{2}$-in. to 2-in. scale, and, of course, Mr. Cochrane understands that in general all that is necessary to do is to increase the dimensions by one-third —$\frac{3}{4}$ in. becomes 1 in. and so on. However, he mentions the $\frac{3}{8}$ in. diameter hole in the right-hand tender-side, which is for the nipple for the water-cock of the injector.

Now this is one case where the increasing is *not* necessary. Anyone building to 2-in. scale can fit the same injector as the $1\frac{1}{2}$-in. job—it will still feed ample water to the boiler. So that is that.

Incidentally, Mr. Cochrane has a yearning some day to build a real working steam-wagon. Well, so have I, and perhaps at some time in the not too distant future, if there is sufficient call for it, and if the editor permits, we might get out detail drawings and instructions for, say, a 2-in. scale Foden. But there's a lot to do on the Allchin before we can consider what the next job is to be ! (It might even turn out to be a Fowler "Big Lion" road locomotive !)

(To be continued)

Queries and Replies

Enquiries from readers, either on technical matters connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by a stamped, addressed envelope, and addressed : " Queries Dept.," THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

In all cases, the fullest possible particulars of the problem should be given, and in the case of electrical queries dealing with windings, etc., all dimensions of rotor or stator, slots or space available on transformer limbs, and cross-section of cores are essential.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the services of an outside specialist or consultant, a fee may be charged depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query ; but subdivision of its details into not more than five separate questions is permissible. In no case can purely hypothetical queries, such as examination questions, be considered as within the scope of this service.

Queries involving the valuation of models or any matters concerned with buying and selling new or second-hand models, cannot be entertained.

No. 9968.—Ignition for " Seagull " Engine
A.B. (King's Lynn)

Q.—I am unable to obtain a special two-spark ignition coil recommended for the " Seagull " engine. Will you please advise me as to what method of ignition can be used with this engine ?

R.—In the absence of the special coil, it would be practicable to use :

(a) a single ignition coil in conjunction with a high-tension distributor as used on the " Seal " engine,

(b) two coils operated by a single contact-breaker and firing a spark simultaneously in each cylinder once per revolution, or

(c) two coils, each operated by a separate contact-breaker, driven at camshaft speed and timed to fire in turn at the top of the appropriate firing stroke on the individual cylinders.

These alternative methods were referred to in the description of the engine, and are also specified on the detail blueprints.

No. 9966.—Making a Welding Plant
W.S. (Chorley)

Q.—I have a transformer, input 230 volts, output 60 volts, 30 amps, and I am thinking of making a welding plant. Could you please give me any information on extra equipment that would be needed.

R.—A voltage of 60 is too low for practical welding ; 80 volts is a more suitable voltage. If you have room on the secondary, you could wind on extra turns to increase the voltage. The volt-turns cannot be estimated without knowing the core section. Welding transformers are of special design, their open circuit voltage being in the region of 100 ; this is for the purpose of striking the arc satisfactorily. After the arc is struck the voltage will automatically drop to a suitable value. A regulator is necessary in the arc circuit ; this is usually a choke coil. Electrodes are necessary together with suitable holders. The electrodes are made to suit the various metals and their application : any firm of welders would advise as to the materials for your particular work.

No. 9972.—Rewinding for Reduced Voltage
J. H. (Potters Bar)

Q.—I have recently purchased several BTH d.c. motors ¼-h.p. 230-250 V supply, 1,425 r.p.m. I would like to rewind shunt and series coils for 110 V d.c. supply. At present, the shunt fields are wound with 38 triple enamelled copper wire, and the series coils with single 26 enamelled wire. I should be glad of your advice on this matter.

R.—The simplest way to alter your generator for the reduced voltage would be to parallel the field coil windings. In reconnecting for the parallel arrangement, care must be taken to see that the polarities of the two windings match. This is easily done by the use of a pocket compass and a small dry battery. There may be some series field adjustment after reconnecting, but this is a matter of trial and error. If you choose to rewind, you will reduce the present turns by just one half, but increasing the wire size to approximately twice the gauge as the original winding. This is for the shunt coils. The series coils are increased in a like manner, but some adjustment may be necessary, and this is a matter of trial and error by the adjustment of the series turns for loading.

No. 9974.—Conversion of Motor
J.S. (Enfield)

Q.—I acquired from a scrap yard what I believe was a generator. Details are as follows: 4-pole pulley laminated field poles connected in series one with another. Wound armature 23 slots (semi-closed) with commutator. Armature laminations $3\frac{1}{4}$ in. diameter × $2\frac{3}{4}$ in. long. The brush gear was damaged, but consisted of two brushes at 90 deg., with provision for rocking. I removed the brush gear and with not a little uneasiness connected the field winding (4-poles still in series) across the 230 V mains. To my relief no heating was apparent after a long period. The commutator was then bound with copper ribbon to shunt all segments together, and on again connecting to the mains, to my great joy a very gentle spin of the shaft caused the armature to run up to speed as a 4-pole reduction motor. Now the snag! The motor very satisfactorily worked a $3\frac{1}{2}$ in. lathe, although the armature would heat up after about half an hour and commence to dissipate excessive heat to the field windings. Note that the heat originated in the strapped armature. I therefore dismantled the motor, stripped the armature windings, and made a squirrel case by fitting two aluminium discs $3\frac{1}{4}$ in. diameter × $\frac{3}{16}$ in. thick and 23 $\frac{3}{16}$ in. diameter silver-steel rods nutted at each end. Each rod, of course, lay in a slot but naturally left a little air space. The motor now refused to start even by spinning the shaft with string wound on the pulley?

R.—It would have been better if you had approached us before you attempted to make any alterations to your motor. In its original state it could have been altered into a suitable repulsion motor by the fitting of suitable brush gear. The heating to which you refer would be normal for this class of motor. In its original state, and converted on the lines indicated, an alteration of the field winding would have been necessary. Your conversion of the motor as a squirrel cage machine is not possible on the lines indicated. Rotor bars must be a non-magnetic material. Brass, aluminium or copper are suitable. Copper is nearly always used. The armature slots are not sufficient to be of any use and neither is the field system. The field or stator coils should be arranged as distributed coils; this means that the coil is spread over a number of slots and not round a single pole as now. There is now only one practical answer to your problem and this must, of course, be experimental. You may put two bars in each armature slot and separated from each other, not necessarily by any insulation. These bars should be of a width and depth that will fill the slots, and the entry to the slots may be filed wider to enable the bars to be easily fitted. "Copper" end rings should be provided and will be $\frac{1}{2}$ in. thick, the bars will be soldered to these rings; this serves for the rotor. The question of the stator system can now only be that of the "shaded" pole type. At approximately one quarter of the pole area, a slot should be sawed through each pole on the same side. This slot should not be less than $\frac{1}{16}$ in. wide, the depth of the slot will be determined by the available depth of the pole tip at this point, but it should not be less than $\frac{1}{2}$ in. In this slot is fitted a $\frac{1}{16}$ in. wide copper strip in the form of a complete loop, the ends being soldered or brazed together. The coils will now have to be rewound to about half the number of their present turns and at the same time doubling the area of the wire. Plain enamel wire is suitable for the winding. The motor converted on these lines will have a rather weak starting torque, and its overall performance will not, of course, compare with a true single-phase motor in the accepted sense.

No. 9975.—Electric Motor Rewinding
W.B. (Co. Durham)

Q.—I have an electric motor, the armature of which has been burnt out and stripped before I got it. It is a 2-pole machine and I would like to rewind it. I was wondering, therefore, if you could supply me with the necessary information, i.e. coil-span, size of wire, number of turns, etc. from the following information, for the rewinding of the armature? Core diameter, 3 in.; Core length, $1\frac{5}{8}$ in.; Number of slots, 23; Number of segments, 68; Proposed voltage, 220-250; Approximate horse-power, $\frac{1}{4}$.

R.—A winding for a motor cannot be calculated just from the armature details alone; it is necessary to know the field data. If you know the turns per field coil and the gauge of wire, the armature turns can be dealt with. Failing this, you must provide a sketch of the field system in detail and also whether the field iron is laminated or otherwise constructed. You state the motor has 2 poles with a 23-slot armature; if the motor has two poles, the commutator segments require to be a number of a multiple of 23. In this case 69 bars, this being 3 bars per slot, would be correct. Perhaps you would check this.

No. 9978.—Converting Shunt to Series Wound
F.G.A. (Sowerby Bridge)

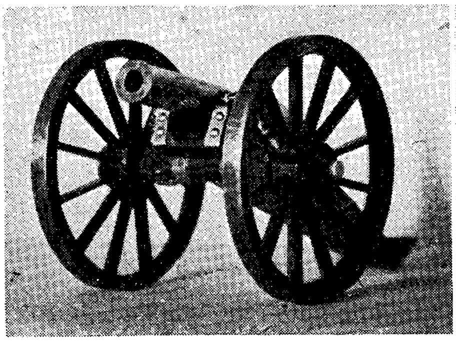
Q.—A short while ago I purchased, through THE MODEL ENGINEER a U.S.A. Air Force surplus motor blower, rated 1/50th h.p. This is shunt wound d.c., but as the armature and field magnets are laminated I wish to make it series wound so that it will have higher r.p.m. and will run from a.c. transformer. It is rated as 27 V 1.5 A, 2 pole. Will you please give me the number of turns and gauge of wire to use to make this motor into a series motor?

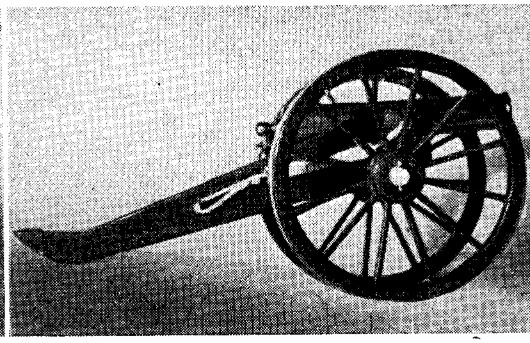
R.—The simplest way to convert your motor to the conditions you require would be to parallel the field coils. In paralleling, the inner ends of the coils are joined together, and also the outer ends, it will be necessary to see that the coils come up right so far as polarity is concerned; this is easily checked by a simple pocket compass and a dry battery. Having paralleled the coils, they are connected in series with the armature. Reversibility is obtained by changing over the brush leads. If you wish to re-wind the field coils, you can wind on each field coil slightly less than half the present turns and increasing the section of the wire now on by twice its diameter.

PRACTICAL LETTERS

A Model of a Captured Gun

DEAR SIR,—The reproduced photographs are of a model gun, to a scale of 2 in. to 1 ft. The prototype is one of a pair captured at Omdurman which now stand outside the "Green Jackets" Depot, Winchester.





The barrel is made from a manganese bronze propeller shaft, for which I am indebted to Mr. J. Clinker, as I did not possess a lathe at the time. The trunnions, blocks and sighting brow were brazed on.

The trail was once a door jamb. Of the wheels, the felloes, and the stocks were made from laminated ply, cut out by hand, and the spokes are spruce. A length of sheet band purchased for 1½d. provided the tyres, which were made to a tight fit, brazed, and then eased on with a hammer. The other fittings were produced from odds and ends.

The wheels are 6 in. in diameter, the barrel is bored ½ in. and the model is 12½ in. long overall.

It is painted dark green with the barrel and the iron work on the carriage polished. I have left the tyres dull and added some blancoed rope, so dear to the heart of all true gunners, which normally holds a rammer and flexible scourer in place. The photographs are by M. J. Froud.

The gun will fire blank rounds, and I hope that it will come in useful as a starting gun.

Yours faithfully,

Winchester. E. BIDDISCOMBE.

Old Sussex Engines

DEAR SIR,—I read with interest, Mr. Greenwood's letter in THE MODEL ENGINEER of September 11th, 1952, about engines in Sussex.

From information and observations on a recent holiday there, I think I can provide the answers. The Fowler ploughing engines would be No. 15420/1, owned by Mr. Lugg, of Billingshurst.

The engines half-way up Billingshurst bank would be two Burrells (general-purpose tractions). Single, and single-crank compound.

The engine at Chichester would be the Fowler "Supreme."

The showman's engine, *Fowler*, at Shoreham, would be owned by T. Smith & Sons (amusement caterers).

The centre-engine would be Savage 699, *Dawn*, which drives this firm's three-abreast gallopers.

Yours faithfully,

Hexham. J. L. MIDDLEMISS.

CLUB ANNOUNCEMENTS

The Society of Model and Experimental Engineers

The next meeting of the Society will take place at the Caxton Hall on Monday, October 6th, at 7 p.m., when there will be a programme of films dealing with railway topics, kindly loaned by the Railway Executive of Euston House.

Full particulars of the Society may be obtained from the Secretary, MR. E. C. YALDEN, 31, Longdon Wood, Keston, Kent.

North London S.M.E.

The Society's Boat Section took the platform at the September general meeting, and entertained members with a comparison between slow and fast boats, and their respective power units.

Mr. Gordon put out a challenging appeal for true scale powered models—boats that really looked like their prototypes. A lively discussion followed.

Particulars of future general meetings are: October 3rd: "All my own work," by selected members; November 7th: Grinding demonstration by Mr. J. E. R. Wuidart; December 5th: "Rail Cars," by members of the Car Section.

Hon. Secretary: W. W. RANSOM, 14, Betstyle House, 197, Colney Hatch Lane, N 10.

Harrow and Wembley Society of Model Engineers

Our programme till the end of November is as follows:

Wednesday, October 8th. Lantern talk by Ron Emery: "Trawl Ho!" An unusual and absorbing talk, illustrating (by Ron's own photographs) a week aboard a Grimsby Trawler.

Wednesday, November 12th. Lantern talk: "Techniques of Model Making," by Mr. G. H. C. Jones, Foreman of Works, The Science Museum, South Kensington.

Wednesday, November 19th. Locomotive Section evening.

Wednesday, November 26th. Film night.

Hon. Secretary: C. E. SALMON, 11, Brook Drive, Harrow.

South London Model Engineering Society

The last of the season's inter clubs visits will be held on Sunday, October 5th, when by the kindness of the Sutton Society the South London Society will be running locomotives on Sutton's track at Chatham Close.

The following Sunday, October 12th, the Society holds its meeting at 11 a.m. at the White Horse Hotel, Brixton Hill, S.W., when a discussion will take place—"Shaper v. Miller."

Full particulars of membership etc., from the Hon. Secretary: W. R. COOK, 103, Engleheart Road, Catford.